EUROPE 1992 & THE ONTARIO ENVIRONMENTAL PROTECTION INDUSTRY

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ONTARIO ENVIRONMENTAL PROTECTION INDUSTRY

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EUROPE 1992 AND THE ONTARIO ENVIRONMENTAL PROTECTION INDUSTRY

EXECUTIVE SUMMARY

The 1990s are expected to bring a significant change to the economic environment in Europe. Two major political/economic forces acting on the European Community (EC) are the completion of the Internal Market - Europe 1992 - and the economic liberalization of Eastern Europe. These changes are occurring, however, at a time in which industrial development issues are increasingly sharing the political platform with environmental concerns. These concerns have fostered the growth of a vibrant market for goods and services which prevent, abate or control pollution as well as an environmental protection (EP) industry to meet this demand.

In view of these developments on both economic and environmental fronts, the Ontario Ministry of Industry, Trade and Technology is seeking to deepen its understanding of the potential changes in the European environmental protection market, and to identify opportunities for, and challenges to Ontario firms participating in domestic and export markets for environmental protection goods and services.

Ontario EP Industry

The greatest **strengths of the Ontario EP industry** lie in its services firms and in certain niche-product markets, particularly in water and wastewater treatment and in control, sampling and monitoring (CSM) equipment. The limitations of the industry in terms of export potential are reflected in the domination of foreign-owned companies (mainly American) in most segments of pollution control equipment (with the exception of solid waste treatment equipment). A potential strength of the Ontario EP industry could lie in the commercialization of in-house process technology by the many large resource-based companies in the province.

Ontario EP exports to Europe have historically been quite limited. There are several major barriers that would have to be overcome to significantly expand the Ontario presence in this market. First, much of the equipment used in EP applications is basic industrial process equipment or customized equipment installed on-site that tends to have a high local content.

Second, in the more specialized equipment areas that are internationally traded, Ontario relies heavily on imports or foreign technologies made by licensees or multinational subsidiaries (although there are some promising niche-oriented Ontario firms in the equipment and instrument field). Third, many service sector firms and in-house experts in user industries have not yet shown interest in exports to Europe or perceive significant trade barriers due to such factors as local firm advantages, licensing requirements and the high cost of establishing the necessary local presence overseas.

EC Environmental Protection Market and Industry

The **EP equipment and services market** in Europe is well established in each of the leading economies of the EC. While it is difficult to summarize the overall "state of the environment" in a given country, Northern European countries (e.g., Germany, the Netherlands, Denmark) have generally matched or exceeded North America on some elements of environmental protection, and lagged behind on others. Southern Europe, including EC members such as Spain, Italy, Greece, Portugal, and to some extent France, have generally trailed both Northern Europe and North America in addressing environmental problems. Northern European countries are also likely to be first off the mark in using innovative technologies to address environmental protection requirements, with much of Southern Europe still focussed on bringing in basic controls for municipalities and industry.

The total EC market for environmental protection goods and services is estimated to represent about 1.1% of the EC's GDP, or on the order of US $50 billion in 1987. Other estimates range as high as putting the total market size at closer to US $100 billion in 1989. To put these figures in perspective, a report by Helmut Kaiser Consultancy estimated that Western Europe currently accounts for about 1/3 of the global market for environmental technology, with roughly the same share attributed to the United States.

The structure of the **EP industry** is quite different across the EC, with differences in public sector participation (often a constraint to private sector marketing and imports in particular) and in the types of firms that have diversified into environmental protection (large industrial conglomerates in Germany, water utilities in France and the U.K.). While tariff barriers are low, there are still major non-tariff barriers that heavily favour local firms, particularly in the supply of services. Local offices, joint ventures or licensing agreements with local firms are generally required for successful market penetration. Direct imports are most successful in Southern Europe or in small national markets.

EC Market in the 1990s

Overall, the **European Commission** has to date made greater progress in setting standards for environmental quality than in regulating emissions or waste handling procedures at individual industrial or municipal sites. While the overall momentum is towards greater uniformity in emissions standards, there is still some resistance to such standards in countries that have historically lagged behind other EC members on environmental matters. Furthermore, the degree to which the EC is able to ensure that Member States not only establish the required legislation, but also enforce their measures, is still weakened by the relatively modest EC institutional framework for monitoring compliance.

Nevertheless, the combination of new centralized regulatory pressure and increased EC and other institutional funding for environmental projects is expected to provide a boost to demand for some environmental protection goods and services, particularly where government, World Bank or EC funds are available. The EC is likely to remain the key regulatory force in those countries that have typically waited for such outside pressure before enacting national legislation, including France, the U.K., Belgium, Italy and Spain. In other countries (e.g., Germany, the Netherlands, Denmark), national legislation may run ahead of EC requirements.

Although not an exhaustive list, the following are some of the areas in which EC policies are likely to generate near-term environmental protection expenditures: flue gas desulphurization (and later, denitrification), particularly for large combustion processes and new municipal incinerators; continuous emission monitoring equipment for CO, dust and HCl for municipal incinerators; catalytic converters for automobiles; municipal wastewater treatment plants situated near bathing areas or eligible for funding under programs for the Mediterranean basin; environmental impact assessment consulting; clean technology engineering for new industrial plants; substitutes for CFC's; monitoring and testing water quality, for such contaminants as mercury, HCB, cadmium, DDT and carbon tetrachloride; and municipal and regional solid waste management.

Major expenditures in these and other areas could be triggered if some or all of the proposed directives aimed at tightening EC policies are adopted. In the longer term, as national governments recede in importance relative to the Commission, and pressures to put industry on a level-playing field in terms of environmental protection costs increase, these tougher measures will have a greater likelihood of adoption. At present, however, it appears that the impetus for very tough action on the environment may well rest with the national governments of the EC

member states, particularly in some of the major EP markets where national standards already exceed what is likely to be agreed upon by the Community.

Aside from EC policies, the report also examines EP developments in certain key EC member states: Germany; France; the U.K.; Italy and Spain. The report also touches briefly on developments in Eastern Europe. Future demand for EP products and services is likely to remain strongest in the countries which currently have the largest environmental markets. Germany is likely to remain by far the largest EP market, due to the political strength of its environmental movement and the sheer size of its industrial economy. Italy and Spain are likely to gain in overall market importance due to the economic growth anticipated in Southern Europe, the degree of the problems remaining to be addressed, and support for environmental protection from public opinion (Italy) and externally-provided funding (Spain). Neither is likely to surpass the U.K. or France in total spending on the environment.

Opportunities, Challenges and Strategic Responses

Overall, while the European EP market is likely to see significant growth, only some Ontario companies may possess the technological advantages relative to existing European market suppliers to find an entry into this very competitive market profitable, particularly during a period in which North American demand will also be growing strongly.

Although a number of firms may sell services for individual projects in Europe, establishing a permanent presence in the EC market is likely to be a costly exercise, and therefore an option available only to the larger, better financed Ontario EP service firms. Strong demand will create opportunities in Europe - if only due to the limited number of qualified engineers available to meet a growing environmental demand - but many Ontario EP firms will also find themselves short of skilled staff to meet North American demand.

There are two basic **market entry strategies** for Ontario goods manufacturers: direct exports or through a manufacturing presence in Europe. The former option is likely to be most feasible for high-value, low-volume, light products such as some CSM equipment. Regarding the latter option, licensing or joint venture arrangements with European firms is more likely to be a favoured approach over establishing a greenfield investment or direct acquisition.

For services firms, with much less scope for direct export, acquisition of an EC-based environmental services firm is likely to be more effective for developing a pan-EC market

strategy than the establishment of a greenfield office. Ontario resource firms could seek to market their overall technological knowledge in licensing arrangements. Other steps to marketing in the EC include: trade missions, fairs and conferences; pilot projects and personal contacts.

EUROPE 1992 AND THE ONTARIO ENVIRONMENTAL PROTECTION INDUSTRY

1. INTRODUCTION

1.1 Background

The 1990s are expected to bring a significant change to the economic environment in Europe. The pace of integration of the major Western European markets under the auspices of the European Community[1] (EC) has been accelerated by the completion of the Internal Market, a process otherwise known as "Europe 1992". Under this process, national governments in the EC are committed to the elimination of all significant regulatory barriers to trade, investment and labour flows among member nations by the end of 1992. At the same time, political changes in Eastern Europe have launched, in varying degrees, a process of economic reform in Poland, Czechoslovakia, Hungary, Romania and Bulgaria, with some moves along similar lines in the Soviet Union itself.

These changes in the political and economic map of Europe are occurring at a time in which industrial development issues are increasingly sharing the political platform with environmental concerns. In Western Europe, these concerns are reflected in pressures to continue to make improvements in environmental controls where initial steps have proved insufficient, and to bring EC member countries up to a common or at least minimum standard for environmental regulations. Public pressures are also for the first time playing a role in Eastern Europe, drawing attention to decades of neglect on environmental matters, and environmental issues will have to be addressed, albeit slowly, in the modernization of the economic infrastructure of these countries.

In view of these developments on both economic and environmental fronts, the Ontario Ministry of Industry, Trade and Technology is seeking to deepen its understanding of the potential changes in the European environmental protection market, and to identify opportunities for, and

[1] The EC comprises Germany, France, the U.K., Italy, Ireland, Spain, Portugal, Greece, Belgium, Denmark, Luxembourg, and the Netherlands.

challenges to Ontario firms participating in domestic and export markets for environmental protection goods and services. Ernst & Young (EY), drawing upon its resources in Canada and Europe, was commissioned to assist the Ministry in this policy and market development process.

1.2 Purpose of this Study

This study is directed at two related objectives. First and foremost, it provides market research to Ontario suppliers of goods and services used in environmental applications that have the potential for export to Europe or which compete in domestic markets against European suppliers. In view of the broad product and geographic market scope of the study (covering 12 EC countries and hundreds of individual products and services), this market research is necessarily focussed at fairly aggregated measures of market size and prospects.

Second, the study identifies changes in the European market connected to the 1992 integration process, and their implications for market opportunities and the strategies that various elements of the Ontario industry might use to address them. These changes include those specifically arising from European Commission directives issued as part of the 1992 process, as well as national and local measures expected to be promoted by political and economic changes linked to European economic integration. To a much lesser extent, since the subject falls outside the Terms of Reference for this study, we also address political-economic developments in Eastern Europe as they relate to environmental market demands.

1.3 Industry Scope

As in other industrialized countries, environmental challenges have led to the emergence of a Western European market for goods and services used to monitor conditions, and to develop and implement solutions to environmental problems. The "environmental protection industry" that provides these products and services is distributed across a wide range of traditional industries, including chemicals, machinery and equipment, engineering consulting, transportation services and the public sector.

There is no common definition for the "environmental protection industry" in use among the various governments and private sector organizations that have examined it. The reports from which the data in this study are drawn generally include products and services aimed at wastewater and potable water treatment, air pollution control, solid and hazardous waste treatment and disposal, environmental assessment and monitoring, and environmental

engineering related to the use of clean technologies. Noise pollution control is sometimes included in the data, and at other times excluded, as is the handling of nuclear (radioactive) waste materials.

The supply of "green" or "environmentally friendly" products is not generally included in the environmental protection industry, and we do not address the implications of EC 1992 for such products in this report. Environmental regulations will also have impacts on such products as pesticides and herbicides which are beyond the scope of this study of the environmental protection industry.

1.4 Methodology

This study draws largely on secondary research in both Canada and Europe, and interviews with market participants and regulators. The research on the capabilities of the Ontario industry was largely conducted by Ernst & Young in Canada, while the European regulatory climate and environmental markets were explored by both EY in Canada and by experts from Ernst & Young's European Community Office, with the assistance of other EY offices in Europe.

Interviews in Ontario were conducted with a sample of 18 Ontario-based firms judged from previous research or past participation in international markets to have export potential. Our sample included firms across a range of sizes, product and service markets. These interviews were used to verify the results of our research on export capabilities and to explore the impressions of the European market held by Ontario environmental protection firms. We also discussed entry strategies with those firms that had already achieved some success in exporting to Europe.

In addition, we interviewed environmental engineers at 5 large firms that have been extensive users of environmental protection products and services to get their views on both the competitiveness of the Ontario EP industry and on the potential for commercialization of in-house capabilities in the EP area. Interviews in Europe included discussions with environmental policy officials at the EC and with key member governments.

The literature review included drawing on a number of previous consulting studies done in Europe, and publications of the EC, OECD and other international organizations . Among other sources, our Ontario industry profile was based upon our previous study of the Ontario environmental protection industry, the results of ongoing work by Ernst & Young to develop

export consortia in the wastewater treatment market, a 1987 study of The Canadian Pollution Control Equipment and Instrumentation Market., and other ongoing work by Ernst & Young on environmental technologies for the federal Department of Industry, Science and Technology. We also reviewed a recent analysis of Ontario's export capabilities conducted for the Ontario International Corporation. In addition, we have benefited from the participation of industry experts within the Ontario Ministry of Industry, Trade and Technology. Other sources are listed in the bibliography for this study.

Much of the focus of our work involved the identification of solid export market opportunities in Europe linked to European economic integration and other ongoing developments. In order to qualify, a market niche had to meet the following conditions:

- Measures associated with "1992" or other aspects of European political-economic conditions will require a significant increase in environmental expenditures;
- The national or regional government involved is expected to undertake expenditures or enforce industry spending to meet environmental policy objectives;
- Ontario firms have competitive advantages or at least no major disadvantages in serving the particular market.

The last requirement, in turn, will be dependent upon the relative position of Ontario and European firms in supplying various EP goods and services in the particular geographic and product market segment involved.

1.5 Organization of this Report

Including this Introduction, this report comprises five Chapters. Chapter 2 provides an overview of the Ontario environmental protection industry, with a focus on identifying products and services with the greatest export potential vis a vis the European market. Chapter 3 documents the current state of the environmental protection market in Europe and the industry serving this market. Chapter 4 is a detailed review of the specific environmental measures arising from the 1992 process and from policy developments in selected Member States, and touches on other factors affecting the prospects for environmental protection. It then draws upon these changes to

identify broadly the outlook for environmental activity in Europe. Chapter 5 seeks to match these opportunities with the capabilities of the Ontario industry to identify appropriate strategies for Ontario suppliers.

Unless noted otherwise, all figures are listed in U.S. dollars

2. THE ONTARIO ENVIRONMENTAL PROTECTION INDUSTRY: STRENGTHS AND VIEWS ON THE EUROPEAN MARKET

2.1 Introduction

Environmental issues have become priority concerns of the Ontario government. Historically, Ontario has led other Canadian provinces — and kept pace with most other political jurisdictions — in its efforts to monitor and control pollution. This public policy stance has been buttressed by an acute public awareness in the province of the deterioration of the natural environment due to industrial and municipal pollution from both Canadian and U.S. sources.

A number of prominent events over the past few years have served to reinforce Ontario's awareness of environmental issues: the ongoing efforts to secure reductions in cross-border acid rain emanating from the U.S.; the multilateral signing of the Montreal Protocol phasing out the use of CFCs; and the recent Hagersville tire fire.

The Ontario government has responded to events such as these with a number of policy initiatives. The Municipal/Industrial Strategy for Abatement (MISA) will establish strict pollution monitoring and abatement requirements on industries and municipalities, and a similar tightening will take place under the CAP program for air quality control. The government has also supported the much-heralded Blue Box campaign to collect recyclable household waste, and is studying other measures to support "3R" activities ("Reduce, Recycle, Reuse").

Increased public awareness and government support of environmental initiatives has been accompanied by the growth of a sizeable environmental protection industry in Ontario. Firms in this industry range from small, niche-market companies to large industrial concerns.

Some of the participants in this industry have actively pursued export markets. In the past, the industry's export activities have been focussed on either U.S. markets or on Third World projects funded by development agencies such as CIDA or the World Bank. In this Chapter, we review the current status of the Ontario environmental protection industry, its strengths and weaknesses in terms of its export capability, and its perceptions of and experience in the European environmental protection market.

2.2 Industry Structure

The significant expenditures required of municipalities and industries under Ontario regulations have generated a sizeable industry supplying goods and services for environmental applications. Although data and industry definition problems make any scale estimate somewhat imprecise, a study conducted by Ernst & Young (then Woods Gordon) for the Ontario Ministry of the Environment in 1988, estimated that the province's environmental protection (EP) industry had total revenues of C$1.5 to C$2.5 billion (see Table 2.1). Total employment was estimated at approximately 28,000, placing the EP industry slightly below the communications industry and ahead of more traditional industries such as clothing and metal mines.

Trade data are similarly incomplete since EP products are often aggregated with other goods in the commodity trade figures, and service sector trade is difficult to measure accurately. Nevertheless, as we discuss below, it appears that Canada and Ontario run a sizeable trade deficit in EP goods, but earn a surplus on its services trade.

Several thousand firms participate in the supply of goods and services in environmental protection markets. Many of these firms are not in the EP industry per se, but rather are suppliers of general industrial machinery and equipment that is used to handle solids, liquids or gases, such as pumps, pipes, blowers, fans, tanks, conveyers and so on. The EP industry itself includes manufacturers of treatment or disposal equipment, instruments and controls, and suppliers of consulting, design, modelling, transportation, disposal and laboratory services.

Given the diversity of firms involved in the EP sector, it is generally necessary to segment the market in order to obtain a clearer picture of its characteristics. The industry can be segmented many ways. At the most general level, one can distinguish between goods suppliers and service sector firms. Another broad way of segmenting the industry is to divide it into those companies whose goods or services are primarily directed at air, water or solid waste pollution.

For the purposes of this study we have used a hybrid of these two approaches to arrive at the following segmentation:

- pollution abatement and control equipment;
- control, sampling and monitoring equipment and instruments; and
- consulting, engineering, laboratory, and waste management services.

2.3 Export Potential by Segment

Ontario's export capabilities in various segments of the EP industry were reviewed with industry participants and purchasers in the province. We also drew upon an analysis prepared for the Ontario International Corporation, a study of the Canadian EP market conducted for the U.S. government, and our previous study of the Ontario EP industry. In addition, evidence of export potential is revealed in the extent of past export success and import penetration in Ontario. Since subsidiaries who import or assemble products in Ontario using foreign technologies are often precluded from exporting by their local market mandate, the extent to which such firms are the major players in Ontario is another useful indicator.

Pollution Abatement and Control Equipment

Overall, Ontario appears to have only modest potential for exports of pollution abatement and control equipment to Europe in terms of the strengths of the domestic industry, although a small number of selected suppliers may have excellent prospects. The limitations of the industry are reflected in a broad sense by its negative trade balance, the predominance of foreign subsidiaries in Ontario, transportation costs barriers and limited differentiation in some of the basic industrial process equipment used in environmental applications. Nevertheless, a number of firms have distinguished themselves by recognized technological leadership or recent export success.

This broad picture of the industry is reflected in Canada's trade position with the rest of the world in environmental equipment products. Estimates derived from a study for the U.S. Department of Commerce suggest that Canada runs a $723 million annual trade deficit in pollution control equipment (see Table 2.2. - the original study does not indicate the methodology used.) The Department of Industry Science and Technology examined only two narrow commodity categories in the trade data for environmental protection goods. They reached a similar conclusion on the size of Canada's trade

balance in EP equipment in 1988, finding a C$145 million deficit in "ventilating and dust collecting equipment" and a C$14 million deficit in "water and sewage treatment equipment".

In the air pollution control field, firms manufacture equipment for desulphurization and denitrification, dust collection, filtering, fume collection and other abatement processes. A wide range of equipment is used in the course of the control and abatement of air pollution including electrostatic precipitators, scrubbers, and cyclones, as well as a large variety of fans, pipes and other industrial equipment and structures that are used in conjunction with more specialized air pollution control products.

The air pollution control equipment industry in Ontario is led by subsidiaries of major U.S. companies such as American Air Filter, Carborundum, Mikropul, Wheelabrator and Joy Technologies. European firms also have a presence in the market with such firms as Flakt Canada and ABB. While most of the equipment manufacturers are foreign-owned, the majority of the assembly and on-site metalwork is done in Ontario. Few if any of these firms are presently involved in significant exports to Europe from their Ontario facilities.

Successful Ontario-based firms tend to be small, niche-market players such as Turbotak (wet-scrubbers) or large resource-based companies, a few of whom have only recently begun to market their in-house process technologies. An example of such a development is Inco, which has successfully marketed the company's flash furnace technology (used for smelting copper sulphide concentrate) in the U.S. Ontario Hydro has also met some success in marketing and selling its flue gas desulphurization technology.

Potable water and wastewater treatment firms manufacture water purifiers, demineralizers, decanters, digesters, dewatering presses, aerators, clarifiers, filters and other water treatment equipment and processes. Much of the equipment purchased for potable and waste water treatment is composed of non-specialized industrial goods such as pipes, rakes, valves, pumps, motors, chemicals and metal tanks.

Like the air pollution control sector, the water and wastewater treatment equipment sector is labour intensive and involves significant local fabrication. As a result of these

extensive construction requirements, Ontario content for most water and wastewater treatment installations is close to 90 percent.

In terms of control equipment, the water and wastewater treatment industry in Ontario is also led by U.S. subsidiaries such as Dorr Oliver Canada. Production in Ontario plants is usually focussed on manufacturing and sub-assembly for the Canadian market, with instruments and other components being imported from the U.S. or overseas or produced under license here. Pumps, valves, tanks and other basic components are both imported and manufactured locally, but we have not identified any very strong exporters in these basic products.

The larger manufacturers are supplemented by many small and medium-sized Ontario firms with successful niche-market products, e.g. Aer-o-Flo Environmental (microorganisms for wastewater treatment); Solarchem and Trojan Technologies (UV systems); Zenon Environmental and Seprotech (membrane technologies) and ECO Tech (ion exchange process for metals recovery). These firms are often technologically driven (i.e., they have emerged or grown as a result of successful R&D efforts), entrepreneurial concerns that anticipate or react quickly to legislative change. A number of these Ontario firms have already established a presence in export markets, including Europe.

Solid and hazardous waste handling and treatment equipment includes manufacturers of compactors, incinerators, composting systems, and other waste disposal equipment, specialized incinerators, plasma arc furnaces and other equipment for the handling and destruction of hazardous wastes. The market division between wastewater treatment equipment and hazardous waste treatment equipment is often not very distinct.

Solid waste equipment is used to collect, haul, and process a wide range of waste materials. Such equipment includes trucks, bulldozers, compactors, balers, loaders, containers, weighing systems, conveyors, cranes, incinerators, packaged sewage treatment systems and separation machines. Some facilities use the heat generated by incineration to create steam for heating buildings or for industrial processes. As in other environmental protection areas, many items with broader industrial purposes play a role in the handling and processing of solid wastes.

This segment of the EP equipment industry is populated by a mix of U.S. subsidiaries and Canadian firms. Solid waste equipment is dominated by heavy manufacturers such as Capital Disposal Equipment (rear loaders), Mack (trucks) and Universal Handling Equipment. Ontario manufacturers do not appear to have any particular competitive advantages in Europe in these products. In the area of containers, Ontario firms are competitive manufacturers of fibre drums for incineration of hospital waste and steel drums to hold hazardous liquid waste and to prevent spills. Transport costs to Europe, however, could pose to barrier to a major export effort.

The hazardous waste end tends to be more specialized, with small and medium-sized Ontario companies in a number of niche-product markets, e.g. Trecan Combustion (solid waste incineration systems), Can-Ross Environmental (sorbents) and Solarchem (UV radiation destruction). It has been estimated that European imports account for half of total Ontario hazardous waste treatment equipment imports.

Control, Sampling and Monitoring Equipment and Instruments

The CSM industry involves the design and manufacturing of EP instruments including gas samplers, filter samplers, gas analysis equipment, and meters. As in the treatment equipment field, Canada and Ontario are net importers of instruments, controls, and sampling and monitoring equipment, with Canada running a large trade deficit in broad commodity categories such as "industrial control equipment", and "thermal measuring/ control equipment". Imports originate in the U.S. and, to a lesser degree, Europe. Many of the leading firms in the Ontario market, such as Fisher & Porter and Beckman Instruments are foreign subsidiaries. Others merely assemble control panels and other products from imported electronic components.

While overall dollar volumes may not be large, there are a few technologically-innovative Ontario companies specializing in CSM equipment that have export potential These include such firms as Barringer Research (Correlation Spectrometer); RAB Dedesco (portable electronic combustion analyzers); Sciex, a division of MDS Health Group (trace gas analyzer); Scintrex (portable NOx monitor); and Canadian Applied Technologies (telemetry system). Several of these firms have already shown promise in export markets, including those in Europe.

Environmental Services Industry

The service side of the environmental protection industry appears to hold some promise for activity in Europe by Ontario-based firms. Although formal data are lacking, Canada is thought to run a trade surplus in EP services, with exports to the Third World, the U.S. and in some cases to Europe.

This segment includes consulting and design work by engineering firms, industrial contracting, laboratory services, and waste management services. Firms in this sector assist in the design, selection and installation of equipment, and in monitoring, atmospheric modelling, sampling and testing services. Industrial construction contractors are used when major facilities (sewage treatment plants, smoke stacks etc.) are built. Laboratories analyze samples for process control and regulatory compliance purposes. Many of the services in solid waste treatment and disposal are provided by the government sector. However, private suppliers also provide dumpsters, hauling services, landfills, and incineration services. Other service areas include sludge handling, groundwater testing, site remediation, environmental impact assessments, and public policy consulting.

By the very nature of their output, as well as due to licensing requirements and other trade barriers, service sector firms in the environmental field typically require a strong local market presence to conduct their work. These forces, along with the fairly up-to-date regulatory climate in Ontario, have stimulated the growth of a strong domestically-based EP service sector in the province.

Thus, in contrast to other segments of the EP industry, the environmental services industry in Ontario is dominated by locally-based firms. Hatch Associates, Gore & Storrie, Proctor and Redfern, MacLaren, and Acres International are some of the province's large consulting engineering firms with strong records in environmental services. A few foreign-based firms also participate in this market (Davey-McKee, Bechtel). In the field of solid waste management, Ontario is home to one of North America's largest waste management firms, Laidlaw Inc., as well as a number of smaller firms. Some of the other large firms in solid waste management are U.S.-based (e.g.

Browning-Ferris International) Laidlaw has already been actively pursuing opportunities in other countries, including markets in Europe. Laboratory, meteorological, site clean-up, geophysical, sludge treatment and other services also have a high domestic-firm presence in Ontario.

In addition to these EP firms, Ontario heavy industries and utilities also have a considerable degree of in-house expertise in environmental matters. For the most part, these firms and institutions have not yet actively commercialized these skills for sales to other organizations.

Despite the strength of the domestic industry, many of the same forces that have protected the Canadian market from imports of EP services will pose impediments to exports to other industrialized countries. Laboratory services are not generally exported except when linked to aid-funded projects in the Third World, although labratory firms can set up operations in other countries. Engineering and construction firms generally face local licensing requirements and need a strong local market presence. We discuss the issue of trade barriers in Chapter 3.

Summary

From this overview, it appears that the greatest strengths of the Ontario EP industry lie in its services firms and in certain niche-product markets, particularly in water and wastewater treatment and in CSM equipment. The limitations of the industry in terms of export potential are reflected in the domination of foreign-owned companies (mainly American) in most segments of pollution control equipment (with the exception of solid waste treatment equipment).

A potential strength of the Ontario EP industry could lie in the commercialization of in-house process technology by the many large resource-based companies in the province (e.g. Noranda, Inco, Abitibi, Dofasco), which would be relevant where they are locally-based firms whose technology exports would be likely to benefit Ontario. Both Inco and Ontario Hydro have begun to market some of their proprietary technologies in recognition of this potential.

2.4 Experience in Europe and Perceptions of the European EP Market

Our interviews in Ontario were sampled from domestically-based EP companies that have had some experience in selling or attempting to sell into the European market[2]. In choosing which companies to interview, we drew upon the Ministry's CIS (Company Information Services) database for those companies currently exporting to Western Europe. While our search listed over 140 companies, it was evident that the vast majority of these companies were either only marginally or not at all involved in the EP industry, or their sale of EP goods to Western Europe was very small in both dollar terms and as a share of their total activity.

Using a number of other sources as indicators of current Ontario EP activity in the EC market[3], we were able to interview 18 EP companies with some activity or interest in Europe, or having significant skills with export potential. In addition, the five "user industry" organizations were asked to relate their views on Ontario's prospects in Europe and, where relevant, on their own firm's potential for commercializing in-house expertise for export to Europe. The remainder of this section reviews the results of these interviews.

European Experience

Very few Ontario companies appear to be currently involved in supplying to the EC environmental protection market. Many Ontario-based equipment manufacturers are small to medium-sized companies with few resources to devote to aggressively pursuing foreign export markets. Those currently exporting to Europe appear to be technology-driven companies with some degree of product differentiation (e.g. Barringer Research's SO2 and NO2 monitoring system and Zenon's membrane technology).

A few of the larger services firms, including Laidlaw and Hatch Associates, are active in Europe. Laidlaw has acquired 29% of Attwoods PLC, a British firm with interests in waste collection, quarrying and solid waste landfill sites and transfer stations. Hatch has also recently acquired a UK firm as a means of establishing a presence in the EC market.

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[2] This report also benefited from the work done by Ernst & Young for the Ontario-Quebec Joint Commission for Cooperation.

[3] These included companies involved in the fall 1989 Euronex Trade Mission, recommendations from Ministry officals, and suggestions from industry experts.

Most of the companies we spoke to, if not currently involved in the EC nevertheless expressed some interest in accessing that market. A number were currently involved in joint-venture negotiations with potential EC partners. For example, a medium-sized wastewater treatment company is in the process of negotiating an R&D joint venture with a European partner.

Nearly all of the equipment companies interviewed used sales agents in Europe to market and distribute their products. Service companies have either established local offices (generally the case for larger firms) and/or linked up with domestic firms in Europe.

In terms of market information, most of the companies interviewed have no formal process for monitoring developments in the EC market. Personal contacts and regular attendance at trade shows seemed to be the most common method of keeping abreast of any threats or opportunities that may arise. Trade journals and reports, government sponsored trade missions and information gathered from the company's sales agents were all mentioned as other possible means of gathering information on the EC market.

Attending industry conferences and delivering papers at these events was also cited as an important avenue for gaining a reputation for technological leadership.

"Europe 1992" Views

The ongoing integration of the EC was not seen as a major concern for any of the companies interviewed. Most were unaware of the details of the 1992 program beyond a general recognition that internal barriers within the EC were going to be abolished. Some also anticipated a concomitant increase in external barriers.

Those companies who have recently opened offices in the EC did so not in response to 1992 but rather to the need for an established presence in Europe to adequately service the local market. Nonetheless, there was a feeling that it would be helpful to be on the ground in Europe to be able to fully exploit whatever market opportunities may arise from 1992.

Target Markets in Europe

The exporting Ontario firms that we interviewed tended to be oriented towards sales in Northern Europe (i.e. Germany, the Netherlands, Scandinavia, the U.K.). Regulatory policies and enforcement are (rightly) perceived as having been historically most stringent in these countries, and EP firms have therefore viewed their markets as more promising for sales of sophisticated control equipment, instruments and services. Ontario exporters also feel that the wealthy, educated and environmentally-sensitive local populations in these countries offer support for continued requirements for environmental protection spending.

With respect to longer term prospects, a great deal of enthusiasm was expressed by our respondents for markets in Eastern Europe and the potential for massive public expenditures on pollution abatement and control. The concern in accessing this market was in securing adequate financing, either from government or from multilateral institutions such as the World Bank.

Aside from a few notable exceptions, most of the companies that we interviewed were relatively skeptical about, or uninterested in the growth potential of the Mediterranean Basin countries (i.e. Spain, Portugal, Italy, Greece and, to a lesser extent, France). Although many were aware of the region's widespread pollution problems, doubt was expressed over the willingness of these countries, particularly the poorer ones, to support the required EP programs. Furthermore, it was felt by some companies that any EP work generated in those countries would likely be captured by Northern European companies better positioned to access those markets. Finally, one of the companies that we interviewed found the business culture of Southern European countries to be not conducive to profitable business ventures.

Barriers to Entry

The biggest barrier to entry was deemed to be the strong current competitiveness of the European EP industry. As mentioned above, Ontario imports a considerable portion of its pollution control equipment, including specialized products from Europe. Consequently, it was felt that Ontario firms might not be competitive on a broad front with the larger Northern European EP companies. However, there were some interesting

niche-markets, some of which were occupied by the handful of current exporters. There was strong agreement that exports of "me-too" technologies to Europe would not likely be profitable. Some felt that Ontario might end up importing more EP goods and services from the EC as a result of 1992.

Although environmental engineering firms felt their own skills and expertise were strong, they perceive that other factors pose considerable barriers to entry in Europe. Environmental consulting services require a strong presence in the local market being served, as it is extremely difficult to "export" these services from overseas, except in the course of internationally funded development projects. Basic engineering services (civil, electrical, etc.), as opposed to specialized process design work, often comprise a significant share of the total engineering costs on environmental projects, and these services are usually well-supplied by local firms in Europe. Our respondents for the most part have been reluctant to make the required financial commitment to establish offices in Europe, particularly at a time when they perceive attractive environmental opportunities in North America. Furthermore, they perceive that EC governments tend to support their indigenous companies over foreign competitors in public procurement decisions to a greater extent than in Canada.

Equipment and instrumentation manufacturers demonstrated a wide range of concerns over barriers to entry into the EC market. Generally, the smaller companies (i.e. those under 30 employees) tended to highlight less formal barriers, such as:

- inadequate market information;
- language barriers;
- communications problems (i.e. different time zones);
- marketing costs;
- inadequate funding.

While a few companies anticipated some technical standards problems, others saw the evolution of a common system of testing and certification in the EC which would serve to ease entry into the market.

In summary, the resonant concern among these generally small, niche-product companies in approaching the EC market was the increased cost — in the immediate short run — of doing business in an unfamiliar environment. Among the larger companies, market unfamiliarity becomes less of a problem. Generally, these firms have already been active in the EC market for a number of years and are well acquainted with the ways of doing business in Europe.

Views on EC Competitors in Ontario

Most of the companies interviewed are niche-market players with narrowly defined product lines. Consequently, they do not experience much competition from EC companies in their domestic markets. This situation is not expected to change post-1992. One company even anticipated that the environmental problems of eastern Europe would absorb all remaining excess capacity in the European EP industry, leaving the company's domestic market untouched.

One engineering firm did feel competitive pressures from a number of very large European engineering firms (mainly German) in the Ontario market. Another engineering company was concerned that North American purchasers might begin to favour European-style "design-build" turnkey projects over the traditional approach taken by the North American industry, placing smaller Ontario engineering firms at a further disadvantage. Another company cited a recent Swedish-French marketing alliance as evidence of increasing European aggressiveness in the Ontario market.

2.5 Summary

Ontario EP exports to Europe have historically been quite limited. To take advantage of the growth opportunities discussed in the next Chapter, several major barriers would have to be overcome. First, much of the equipment used in EP applications is basic industrial process equipment or customized, equipment installed on-site that tends to have a high local content. Second, in the more specialized equipment areas that are internationally traded, Ontario relies heavily on imports or foreign technologies made by licensees or multinational subsidiaries (although there are some promising niche-oriented Ontario firms in the equipment and

instrument field). Third, many service sector firms, and in-house experts in user industries have not displayed much interest in exporting to Europe or perceive significant trade barriers due to such factors as local firm advantages, licensing requirements and the high cost of establishing the necessary local presence overseas.

3.0 THE EC ENVIRONMENTAL PROTECTION MARKET

3.1 Introduction

The environmental protection equipment and services market in Europe, while still evolving, has a fairly long history, and a well established EP industry is in place in each of the leading economies of the European Community. While not the focus of this study, in order to appreciate the potential implications of the "Europe 1992" process and other ongoing developments for export opportunities from Ontario, it is necessary to begin with an understanding of the existing EP market in the EC.

In this Chapter, we review the state of the environment in Europe, the current size of the EP market in Europe by segment, and the structure of the EP industry. The scope of this topic, covering 12 countries across air, water, solid and hazardous waste issues, necessitates that we conduct this review in fairly broad terms.

3.2 The State of the Environment in Europe

The European Community will enter the post "1992" period with wide disparities in the state of the environment among member countries. An even larger gap exists between the EC and the nations of Eastern Europe.

The existing differences are attributable to a number of factors, including:

- varying degrees of urbanization and industrialization;
- differences in the ability of industry and government to pay for environmental protection;
- differences in public awareness and concern over the environment; and
- the degree to which public concern has been translated into regulatory policy and enforcement.

While it is difficult to summarize the overall "state of the environment" in a given country, Northern European countries have generally matched or exceeded North America on some elements of environmental protection, and lagged behind on others. Southern Europe, including EC members such as Spain, Italy, Greece, Portugal, and to some extent France, have generally trailed both Northern Europe and North America in addressing environmental problems.

The strong linkage between the modernity of the capital stock in EC countries and the extent of environmental controls was confirmed in a recent study by the EC Directorates General responsible for the Internal Market and Industrial Affairs (DGIII) and the Environment, Nuclear Safety and Civil Protection (DGXI). While aimed at identifying trade distortions against countries where higher environmental standards had been imposed on industry, the study found that industries performing well on environmental criteria were at the same time more competitive as measured by sales, profit and exports. For example, in the steel industry, where environmentally friendlier production costs about 20% more in terms of capital costs, it is also linked to a more-than-offsetting gain in productivity.

While our original mandate in this assignment was to consider the market in the European Community, in the course of doing our work it became apparent that there was considerable interest in EP prospects in Eastern Europe. Although data are not generally available, it is widely recognized that Eastern Europe has done little to protect its environment from contamination from household and industrial waste. For example, pollution problems have already been linked to higher mortality rates in the Polish coal producing area of Silesia and in Czechoslovakia.

A 1989 OECD report[4] provides some useful summary measures that illustrate many of the differences among European countries. As shown in Table 3.1, the percentage of the population served by any form of waste treatment plant (i.e., primary, secondary or tertiary treatment) ranges from close to none in Greece to 98% in Denmark, which has 90% of its population served by secondary or tertiary treatment systems. As can be seen in the table, Northern EC members (Denmark, the Netherlands, Germany and the U.K.) have typically spent more in this area than Southern Europe (Spain, Italy, Southern France, Portugal, and Greece). Other countries that have trailed Canada include Ireland and Belgium.

Water quality indicators for inland waters show that many European rivers were still quite polluted in the most recent data available, including the Po (Italy), Loire (France), Elbe (Germany), Susaa (Denmark), Meuse-Heer/Agimont (Belgium) and Guadalquivir (Spain). Marine waters are also polluted, with beaches threatened in the Mediterranean and on the coast of the U.K.

Emissions of sulphur oxides, nitrogen oxides and particulates into the atmosphere are greatest in total for the largest, most heavily industrialized countries (see Table 3.2). Smog episodes from domestic and transboundary sources are a problem in such countries as Germany and the Netherlands, and Eastern European coal-fired plants also pose significant transborder pollution problems. The degree of air pollution control efforts is captured in part in data on emissions per unit of energy consumed (Table 3.3), which again show the least degree of control for sulphur oxides and particulates in Spain, Greece, and Ireland, and the most stringent controls in the Netherlands, Germany, and Luxembourg. Urban air quality has also suffered from the less stringent controls placed on vehicle emissions in Europe, where countries are only now moving to standards similar to those in Canada.

Solid and hazardous waste generation is closely related to population size and industrialization. Germany, for example, is a major source of chemical industry waste. Overall, however, European households tend to produce less waste per capita than those in North America (see Table 3.4).

[4] OECD Environmental Data: Compendium 1989, (Paris 1989)

Future environmental pressures will be tied in part to industrial development and urban population change. As part of their analysis of environmental problems in the Mediterranean, the World Bank and the European Investment Bank (EIB) have projected rapid population growth in Spain, Greece, Yugoslavia, Bulgaria and Turkey over the next 35 years, adding to the threat to environmentally-sensitive areas in the Mediterranean Basin. The highly sensitive terrestrial areas are, in the majority of cases, located on river estuaries. In addition, there are many marine areas where tourism and industry have put too much pressure on marine resources.

3.3 Existing Markets for Environmental Protection

Expenditures on environmental protection have varied widely across Europe, both in absolute terms and as a share of national income. These differences in market size reflect variations in the degree of regulatory control indicated in the picture of environmental health discussed above, as well as differences in the sizes of the various national economies.

As in North America, there are significant variations in estimates of the size of the EP market in the EC countries, due to a lack of official government statistics at the appropriate level of disaggregation, and differences in the definitions used for what constitutes an environmental protection good or service. The following products and services are generally included in the estimates we have obtained for the EP market in Europe:

- Services, such as waste disposal and treatment;
- Environmental engineering, such as the use of clean technology by utility providers and industry;
- Repair and maintenance of installations;
- Civil engineering for environmental installations; and
- Supply of EP equipment.

Generally excluded were "green" consumer products, such as biodegradable products, organically-grown produce and so on. In contrast to Ontario data, noise pollution control measures are included in EC figures for environmental protection.

Overall market size estimates tend to be subject to considerable uncertainty as a result of the paucity of data from official statistical agencies. As a result, there are some discrepancies in the data we have examined from various private sector reports on the EP market in Europe. Nevertheless, there is a general agreement on the approximate relative sizes of the various national markets, and the key segments in each. In any event, the absolute magnitude of these overall market size numbers are not particularly relevant given the large scale and breadth of the markets covered relative to the potential interests of any given Ontario supplier.

In total, as shown in Table 3.5., the European Community market for environmental protection goods and services is estimated to represent about 1.1% of the EC's GDP, or on the order of $50 billion in 1987. Other estimates range as high as putting the total market size at closer to $100 billion in 1989. To put these figures in perspective, a report by Helmut Kaiser Consultancy estimated that Western Europe currently accounts for about 1/3 of the global market for environmental technology, with roughly the same share attributed to the United States.

There is general agreement that the German market is by far the largest in the EC, and that it is about 2-3 times as large as the EP markets in France or the U.K. The various studies examined generally put the markets for EP goods and services in each of Spain, Denmark, and Belgium in the $1-2 billion range per annum.

Potable and wastewater treatment accounts for 1/3 to 1/2 of the total market for EP goods and services in the EC. Solid waste issues generate about 1/3 of the total. Air quality concerns account for 1/4 to 1/3 of total expenditures. Noise pollution control and energy conservation (included in some data sources) are modest contributors to the overall market totals.

The situation in the various European countries differs considerably with regard to the total market size as a share of GDP, and in the relative importance of the subsectors of water, waste, air and noise. Within the broad market categories, there are also important differences in the types of expenditures being undertaken, which are in turn related to the degree to which problems have already been addressed in the past.

In the wealthy, most environmentally-advanced nations, such as Germany and the Netherlands, the current emphasis in industry is on changes in production processes that reduce waste generation. The markets for traditional end-of-pipe systems in these countries will be weakened by the new emphasis on integrated, clean technologies. The U.K. and France are thought to be 5-6 years behind in the use of this technology. Among these Northern European countries, municipal water treatment projects frequently involve the introduction of tertiary treatments to precipitate nitrates and phosphates. Recycling and composting of wastes is most common in the EC in Germany, Belgium, and France, although Spain is an exceptional case from Southern Europe in its high rate of recycling.

In general, Southern Europe, where controls are only now being put in place, is still focussed on end-of-pipe solutions for industry and introducing primary treatment systems for municipal wastewater. Italy, Portugal and Greece have not gone far in recycling or composting. Overall, Southern Europe is thought to be about 15 years behind the rest of the EC in terms of its adoption of environmental protection technologies.

3.4 The Environmental Protection Industry in Europe

Domestic EC Firms and Public Sector Involvement

As in North America, there are numerous firms participating in the supply of environmental protection goods and services, ranging from specialized consultants and equipment manufacturers to large industrial concerns with environmental divisions. Table 3.6 provides an overview of the industry in five major EC countries.

As indicated in the Table, although the general trend is towards increased concentration, there are still as many as 4,000 EP suppliers in Germany and 2,300 in Italy, with roughly 8,000 firms in the EC as a whole. Many of the most significant players in this market are not new firms, but rather industrial and engineering companies that have diversified into environmental markets from their base industries. For many of these firms, EP products and services represent 1/3 or less of their overall sales revenue. In other cases, local utilities have entered the EP market or purchased existing EP players. The increased presence of these large industrial concerns in the EP market is expected to lead to a consolidation in the number of EP suppliers, as the majors purchase smaller firms to acquire their technologies or skills.

Among the firms with sizeable EP activities in the EC are:

- Sweden's Flakt and Asea Brown Boveri (Swedish-Swiss);
- Many of the large industrial groups in Germany, including electric utility R.W.E. (Lahmeyer), Hoechst (Uhde), Deutsche Babcock, Siemens, Thyssen, and Metallgesellschaft (Lürgi); major waste generators such as BASF and Bayer are also constructing their own incineration facilities;
- Denmark's Kruger and Danisco; and
- French utilities Companie Générale des Eaux and Société Lyonnaise des Eaux, which control water treatment firms such as Degremont and OTV.

Entrants to the industry include construction groups such as Wimpey (U.K.) Bouygues (France), and Philip Holzmann (Germany). A number of state or local utilities, such as the water utilities in the U.K., have also branched out into supplying EP market services. Thames Water is expected to emerge as an international water treatment market player, as are British solid waste companies such as BIFFA and Attwoods (minority owned by Laidlaw).

As recognized by Ontario companies that have made forays into the EC market, the European industry has a greater degree of vertical integration than is the case in Canada, with common ownership linking equipment manufacturers, engineering companies and industrial construction firms. Many of the largest firms are involved in a wide range of equipment and engineering activities covering solid, liquid and gaseous wastes. An integrated design and build capability is often held within a single firm, with engineering companies often serving as general contractors. Ontario engineering firms, with a few exceptions, have shied away from links to particular process or technology supplier, in order to preserve their independance in selecting equipment on behalf of their clients.

The extent of public sector and private sector responsibility varies quite widely across Europe. Roughly 60% of household waste is collected by private companies in France, as compared to only 5% in the U.K., which is now in the process of privatization[5]. Denmark has heavy public sector involvement, as does Italy. German public sector bodies handle water management, but delegate waste collection for roughly half the population to private waste management firms. Ontario also has a mix of private and

[5] According to RBC Dominion Securities, "Laidlaw Inc.", Research Report (January 29, 1990)

public sector involvement, with household garbage collection in major urban centres and municipal water and wastewater treatment generally handled by the public sector but with a strong private sector role elsewhere.

There is a slow trend, among both EC members and others, towards increased privatization of environmental facilities and services management. Sweden plans to privatize SAKAB, the state hazardous waste management company. The U.K., which has already begun the process of privatization, is expected to issue a White Paper later this year setting out an environmental strategy for the 1990s based heavily on private sector involvement and the use of market forces.

International Presence and Trade Barriers

EC data on international trade in environmental protection goods and services are as incomplete as those for Canada. As in Canada, commodity categories used in official trade statistics tend to aggregate pollution abatement and control equipment and instruments with other non-EP products, and service sector trade data is also not generally available.

In terms of pollution abatement and control equipment, from a number of various reports examined as well as our own knowledge of the European EP market, it appears that direct imports play a fairly limited role in some of the the larger countries in the EC.

According to a report prepared for the U.S. Department of Commerce, for example, imports play a very small role in the German pollution control equipment market[6]. The report attributes the dominance of locally-made products to a variety of factors favouring such products, including: i) their compliance with German technical standards; ii) the high construction component to EP projects, which is generally handled by domestic contractors; iii) limited awareness of tender calls outside Germany; iv) buyer's belief of the need for a local presence to provide timely delivery and pre- and post-sale service; and v) transport costs for heavy equipment. A similar conclusion was reached in an Italian study for the same client on the market for pollution control equipment in Italy[7].

[6] Droege & Co., International Market Research on Pollution Control Equipment in Germany, U.S. Foreign Commercial Service, April 1988.

[7] Teknibank Spa, International Market Research on the Italian Market for Pollution Control, U.S. Foreign Commercial Service, January 1988.

A study by the U.S. International Trade Commission found similar limitations on U.S. exports to the EC[8]. While the EC pump, valve and compressor market, for example, was the second leading destination for U.S. exports after Canada, industry sources estimated that public sector bodies in Europe purchased only 2% of requirements for water and wastewater facilities from import suppliers.

The ITC identified a range of public sector procurement practices that have served to limit the role of imports in supplying products to wastewater, water and solid waste treatment projects. Prior to the recent 1992 Directives, water systems were excluded from EC requirements for open procurement, and most EC countries reserved these markets for national firms, even to the extent of participating with these firms in product development. Barriers in place include the use of small lists of invited firms for tenders, or the use of negotiated tenders, as well as "a wall of technical, procedural and attitudinal barriers." We discuss the proposed changes to these procurement practices in Chapter 4. In some cases, such as in boilers, market forces (transport costs, competitive advantages) have also restricted the U.S. import share.

As a substitute for direct imports, in the largest economies (Germany, France, U.K., and Italy), the foreign presence in the EP market is largely through local subsidiaries of foreign companies or through joint venture or licensing agreements between foreign based firms and local suppliers. To some extent, these subsidiaries import components or finished products from their parent country for marketing within their designated territories.

Even in Germany, which is among the leaders in environmental technology development in Europe, foreign subsidiaries play a significant role in equipment manufacturing. According to Droege & Co., subsidiaries of Swiss, Scandinavian and British manufacturers are very active in the German EP equipment market, and they are joined to a lesser extent by French and Dutch branch plants.

Table 3.7 provides some examples of joint venture, licensing or other agreements between EC firms and those from both other EC countries and from outside the Community. Within the EC, the licensing and joint venture agreements are often

[8]U.S. International Trade Commission (ITC), The effects of Greater Integration within the European Community on the United States, Publication No. 2204, July 1989.

designed to link strong technological leaders in one country (often Germany, the Netherlands, Denmark, or Japan) with firms with excellent market contacts in the home market of another EC country.

For example, all of the leading solid waste treatment companies in Italy, with the exception of DB Impianti, rely on foreign technologies. Firms such as Castagnetti (FIAT group) are collaborating with Japanese firms, while Snam Projetti licenses technologies from Deutsche Babcock. Overall, 15 of the leading environmental technology companies in Italy depend on licenses from Germany, France, the Netherlands and the U.S. According to the EC Task Force Report on the Environment and the Internal Market, two-thirds of the French incinerator market was held by domestic firms with licenses from Denmark, Germany or Switzerland. The British environmental industry is also heavily dependent on foreign technology in such areas as desulphurization.

Japanese firms have also been active in technology licensing within Europe. Japanese standards for air pollution, typically among the toughest in the world, have given their domestic industry a lead in such areas as denitrification. According to the Task Force Report on the Environment and the Internal Market, this led to a spate of technology licensing agreements between the Japanese and German engineering firms following the 1985 move to require catalytic reduction processes in Germany. Mitsubishi, for example, has marketed its technology to Thyssen, Siemens, Bayer and EVT; Kawasaki licensed its technology to Deutsche Babcock; and Lentjes and Uhde have the rights to Babcock Hitachi processes. Similar licensing agreements are in place in the Netherlands. The Swedish pulp and paper industry has seen similar benefits in terms of developing an export market for technologies that were developed to meet Sweden's stringent national effluent standards.

In smaller countries, where branch plants may not be as feasible given the more modest national market, or in countries that have trailed in environmental matters, direct imports appear to have a much more significant presence. Close to half of the Spanish air pollution control equipment market, for example, is supplied by direct imports from Germany, France, the U.S., the U.K., and Italy[9]. Denmark has to import close to two-thirds of its equipment requirements for EP installations, despite having a strong domestic industry in some segments of the market.

[9] Pedro Alcala, The Pollution Control Equipment Market in Spain, U.S. Consulate General, Barcelona, 1988

PedTariff barriers on non-EC products are generally fairly moderate. "Filtering and purifying machinery and apparatus for liquids and gases and parts" face duties in the 4-5% range. Basic industrial equipment used in environmental processes, such as heating and cooling equipment, pumps, compressors, fans, blowers, valves, tanks, and boilers are subject to duties of 3-6%. Imports also face sizeable national value added taxes on landed value plus duties.

The **control, sampling and monitoring equipment and instruments** market is very internationalized, with non-EC firms appearing to own a greater share of the market than in abatement equipment, often importing and marketing through local branches or independent dealers. Many of the leading U.S. instrument manufacturers, including Fishcher & Porter, Leeds & Northrup, Fischer Controls, and Foxboro, have a sizeable market presence in the EC, joining Swiss, German and Dutch firms.

Tariffs on instruments from outside the EC are generally moderate. "Electric or electronic measuring, checking, analyzing or automatic controlling instruments" enter duty free, while their non-electric counterparts face duties in the 5-6% range, as do instruments for physical or chemical analysis or the measurement of heat, light or sound. Value added taxes are applied on imported value plus duties.

Public procurement practices and other non-tariff barriers have impeded sales of instruments to public sector facilities. According to the U.S. ITC, domestic manufacturers typically supply 60-80% of the instruments purchased by EC water utilities, and the non-EC share is as low as 1%. Local, regional or provincial water authorities or private/public enterprises given rights to operate their facilities can choose the degree to which procurement is open to competition. Larger projects often have a 3 year planning phase, during which design work is performed by domestic firms that are subsequently favoured for equipment supplies. Aftermarket parts and service markets are then subsequently captive markets for the original equipment supplier, due to a lack of interchangeability in instruments and systems.

Environmental services markets, as noted above, are in some cases heavily controlled by public sector enterprises, particularly in potable water treatment, municipal wastewater treatment and urban refuse collection and disposal. These public monopolies in environmental services restrict the opportunities for service exports. For example, in the U.K., the public water authorities also incorporate in-house engineering divisions that

supply water treatment consulting. Even the EC Task Force on the Environment and the Internal Market acknowledged that the scope for trade in EP services relating to water, and in some cases solid wastes, will be quite restricted in Denmark, Holland and Germany, where water and waste systems management is under the control of public authorities or franchised to a municipal enterprise without competition. They foresee the greatest trend to private sector involvement in the U.K., France and Spain.

Engineering services are often integrated into engineering construction tenders. Many of the largest European water engineering firms are actively involved in exports. However, as is the case with most Canadian engineering firms, international activity by European engineering firms is primarily directed at Asian and African development projects.

For the most part, foreign firms appear to participate in EC markets (including those of other EC countries) primarily through local offices or joint ventures with domestic engineering or service firms. The French firm SAUR (part of the Bouyges group), for example, is participating in the British water treatment market through links with the domestic Statutory Water Companies, while its compatriot La Lyonnaise des Eaux, and its affiliate Degremont, have a joint venture in Italy with FIAT. The American engineering firm CH2M Hill was recently recruiting to staff an EC office. In solid waste management, major North American players, including Ontario's Laidlaw and Waste Management Inc. of the U.S., have entered the European markets through the purchase of local firms in their target countries.

A number of trade barriers to the direct export of services appear to necessitate the establishment of a local venture (either through a greenfield investment, a takeover, or some form of association with a local firm) for most environmental services companies. These include requirements for local licensing for engineers, market contacts, language capabilities and the desire of purchasers to deal with firms with a long-term commitment to their market (in part to ensure adequate post-sales contacts).

The tender process is often restricted to a small number of local engineering firms that have established contacts with the local authority or industrial firm prior to the tendering process. According to the U.S. ITC, the engineering and construction of public sector works projects have generally gone to favoured "national champion" firms (such as Bouyges and Dumez in France, Philipp Holzmann in Germany and Davy in the U.K.) which are perceived by the U.S. industry to receive financial assistance and other support

from their national governments. Even outside the "public works" field, smaller tenders (below 1 million ECU's for construction works and 200,000 ECU's for services and supplies) can be restricted to domestic suppliers under EC procurement practices.

In some cases, such as laboratory services, solid waste collection, disposal and incineration, construction and equipment installation, the service by its nature must be provided by a locally-resident company.

3.5 Implications for Ontario

This survey of both the state of the environment and the EP industry in the European community has brought out a number of implications for Ontario companies considering an entry into the European environmental protection market:

- Northern Europe (e.g., Germany, the Netherlands, Denmark) is likely to be first off the mark in using innovative technologies to address environmental protection requirements, with much of Southern Europe still focussed on bringing in basic controls for municipalities and industry;
- Market sizes for environmental protection tend to increase with both GDP and GDP/capita, with Germany having by far the largest EP market overall;
- The structure of the EP market is quite different across the EC, with differences in public sector participation (often a constraint to private sector marketing and imports in particular) and in the types of firms that have diversified into environmental protection (large industrial conglomerates in Germany, water utilities in France and the U.K.). These differences will affect the search for joint venture or licensing partners;
- While tariff barriers are low, there are still major non-tariff barriers that heavily favour local firms, particularly in the supply of services. Local offices, joint ventures or licensing agreements with local firms are generally required for successful market penetration. The exceptions appear to be in the market for instruments, although most international firms still have local offices to market their imported products.

Direct imports are most successful in Southern Europe or in small national markets. This suggests establishing a local presence (office, joint venture, or licensing agreement) in one of the major Northern European markets as a base for other EC countries.

We have also identified some implications for foreign investments from European environmental protection goods and services firms:

Germany, the Netherlands, Denmark, and to a lesser extent the U.K and France are the most promising sources for such foreign investments. Several of the leading players in Europe already have investments in Canada, although not always from their EP subsidiaries. The Canadian offices of these firms could be a useful point of initial contact;

Many EC firms have been active in technology licensing agreements. As an alternative to direct investment, licenses or joint ventures might be a way to bring the best technologies to Canada (from the EC, Japan and the U.S.) while strengthening local Canadian EP firms.

4. FACTORS AFFECTING THE EUROPEAN MARKET IN THE 1990'S

4.1 Introduction

To date, Ontario companies generally have not been very active participants in the European market for environmental technologies and services. This is a reflection of the absence of comparative advantages in many equipment markets (with the exception of a few niche markets), trade barriers (both legislated and market-driven) in services, and for some countries, a low level of demand.

A number of forces could change these conditions in the coming decade, thereby opening up opportunities and challenges for the Ontario EP industry. First, and most central to this study, is "Europe 1992". The completion of the Internal Market in the EC is being accompanied by efforts to harmonize environmental regulations across the Community. This process is also expected to result in economic growth that will further increase the demand for environmental protection goods and services. At the same time, regulations on such matters as public sector procurement are undergoing a process of change.

Second, as in North America, environmentalists are gaining political strength in several European countries, and the push from the EC will be supplemented by these national forces in promoting tougher legislation.

Third, Eastern Europe is awakening to the problems created by decades of environmental neglect. The modernization of industry in Eastern Europe will be accompanied by investments in cleaner technologies.

In this Chapter, we explore each of these driving forces, and their impact on the market for environmental protection goods and services in Europe.

4.2 EC Environmental Policies and Programs

Background

As in North America, much of the demand for environmental protection goods and services can be directly traced to regulatory policies and their enforcement. For some environmental products, such as waste management services or water treatment chemicals, there is an ongoing market to be served by EP suppliers. In other cases, such as for pollution abatement equipment or engineering, the ongoing replacement market can be quite small; most of the demand is triggered by the process of responding to tightening regulations or enforcement.

Within the European Community, there are essentially three levels of policy development and administration, and these are also applicable for environmental matters. The

European Commission, as we discuss below, sets out minimal standards and practices that are in turn translated into regulatory policies by the national governments of each country. National governments also set out their own regulatory policies and enforcement practices, which may exceed EC requirements (or, in practice but not in theory, lag behind them somewhat). Local and regional governments are often charged with handling local urban wastes and water treatment.

While the history of national regulations on environmental matters is an old one, the involvement of the EC Commission dates only from 1972. Even then, prior to 1987, the EC Commission had no explicit legal authority to develop environmental policy for the Community. Despite this weak legal status, through a series of "action programmes" which grew out of the Paris Summit Conference of October 1972, EC member nations began the process of creating Community-wide environmental legislation. Since the first action programme was inaugurated in 1973, over 120 legislative acts have been passed on the environment.

More recently, with economic growth expected to accelerate as a result of the completion of the Internal Market, the Community has recognized the need to mitigate the environmental costs that such growth would otherwise entail. A set of environmental policy objectives was enshrined as one of the five major objectives set out in the Single European Act (SEA) of 1987, which granted the Community the legal power to set environmental policies.

Currently, environmental legislation is developed within the agenda set out by the Fourth Action Program (1987 to 1992) and is geared towards the environmental issues surrounding the economic growth generated by the completion of the Internal Market. The EC also wishes to avoid the use of lax environmental standards as a means of attracting industry to one member country at the expense of another.

Principles of EC Environmental Policy[10]

EC environmental policy is based upon a series of principles set out in the Treaty of Rome and amended by the Single European Act of 1987. These principles include:

- **the prevention principle**

- which deals with the prevention of "irreversible damage to the environmental patrimony" of the EC;

- **the "polluter pays" principle**

- which ensures that the polluter "internalizes" the avoidance and damage costs associated with their actions;

- **the subsidiarity principle**

- which maintains that "primary responsibility and decision-making competence" be entrusted to the lowest level of government within the Community;

- **the principle of economic efficiency and cost-effectiveness**

- which addresses both "static efficiency criterion" (i.e. the act of choosing those economic incentives which have the lowest possible cost to the economy) and "dynamic efficiency criterion" (i.e. the assurance that those criteria chosen offer "permanent incentives to further environmental improvements);

- **the principle of legal efficiency**

- which is concerned with the applicability and enforceability of legal instruments used in environmental legislation.

EC Directives on the Environment

Community policies are implemented in the EC through the use of a number of different legislative instruments. The most commonly used instrument in the environmental sphere has been the "Directive". Directives are EC laws that are intended to be binding

[10] Task Force Report on the Environment and the Internal Market, 1992: The Environmental Dimension, Commission of the European Community, November 1989.

on Member States in terms of the results to be achieved. The means, however, of achieving these results is left to the Member State to decide.

In practice, it remains to be seen how effective the EC will be in enforcing compliance by member countries, since many countries are still in the process of implementing legislation to deal with recent Directives on the environment. Currently, much of the Commission's efforts appear to be devoted to ensuring that the text of national legislation is consistent with the Directives set out by the EC, and only a small staff is available to monitor the degree to which each country and regional government enforces its own standards. Some disputes are already arising, with the U.K., for example, contesting a claim by the Commission that its beaches violate EC standards for bathing water, and pointing to other countries that have not yet been fingered by the Commission. We discuss the reputations of individual countries in terms of their compliance with EC measures in Section 4.3.

The two major measures used in applying Community Directives in the environmental area are standards (applying to both product and process) and charges (which include fees, contributions or levies). The breakdown of these measures among the main areas of pollution control is outlined in Table 4.1.

Air Pollution Control

The EC regulates air pollution control in three ways:

i. by controlling the emissions of particular substances into the atmosphere (e.g. the phase-out of CFCs under the Montreal Protocol);

ii. by setting minimum standards for particular polluting products (e.g. car and truck exhaust emissions); and

iii. by regulating certain industrial activities (e.g. waste incineration plants).

EC efforts to adopt uniform minimum standards for emissions into the atmosphere from particular industrial plants or utilities have only been recently promulgated in Directives, which still do not apply to all types of industrial processes. There is still considerable resistance to full uniformity in emission standards across the EC.

SO2 and NOx emission standards for most large combustion plants (>50 megawatts) are being phased over the next 13 years. Even so, the phase-in schedule differs across the EC, and Spain has been exempted from some of the standards for new plants.

Other standards have been put in place that will limit CO (to 100 mg/Nm3), SO2, HF, HCl and total carbon emissions from new municipal incinerators, with a 10-year phase-in of these standards for existing plants.

Beyond these new controls set on individual sources, the EC has set compulsory overall air quality standards — intended to apply everywhere in the Member States — for a variety of pollutants. Both current minimum standards and longer term objectives have been put in place for sulphur dioxide and suspended particulates as well as for nitrogen dioxide. A lead standard of 2 micrograms/m3 (annual average) has also been established.

A Directive on combatting air pollution from industrial sources was introduced in 1984, dealing with the requirements for the adoption of specific control technologies. For new facilities, it mandated the use of the "best available technology economically achievable" (BATEA), i.e., the most effective abatement technology that does not entail excessive costs. This could create opportunities for imports (or licenses) of superior technologies into Europe. The Directive also calls for the gradual application of this principle to existing plants, and the eventual introduction of community-wide emission standards for stationary sources of air pollution. However, as a "framework Directive", it merely sets out guidelines for national legislation by member states, which are likely to be subject to varying interpretations upon implementation.

Water and Wastewater Treatment

Water and wastewater treatment has been a priority area of EC environmental policy. The Community sets minimum quality standards for drinking, bathing and fishbreeding waters, as well as regulating the discharge of toxic substances from municipal and industrial waste into marine environments.

The priority areas of the EC can be summarized as follows:

1. The definition of quality objectives. A number of Directives have established minimum levels of quality for fresh and sea water. Many of these standards have been in place for over 15 years.

2. The protection of the aquatic environment from pollution by dangerous substances. The EC has drawn up a list of substances which are to be eliminated from dumping in EC waters (e.g. heavy metals such as mercury and cadmium). A second list of substances is closely monitored (e.g. lindane, DDT, pentachlorophenol, etc.).

3. The protection of underground water sources and groundwater.

4. The protection of the sea against oil pollution.

5. Measures specific to certain industries (i.e. those which are responsible for greater or more harmful water pollution, e.g. the titanium dioxide industry and the fertilizer industry).

6. Support for Research and Investment Initiatives. (discussed in more detail below).

Although EC bathing and fisheries water quality standards have implications for wastewater treatment systems, there are currently no direct EC standards for municipal wastewater treatment plants. A proposal by the Commission, not yet adopted, would still require only primary treatment for most coastal sites; biological (secondary) treatment would be mandated for other sites, as would further treatment for plants near bathing areas or other sensitive sites. As in the air pollution control field, there appears to be strong resistance from some countries towards a set of uniform point-source standards, and the Commission proposal appears headed for at least a lengthy period of debate within the EC.

Progress has also been fairly slow on the elimination of heavy metals, carcinogens and various toxic substances from the aquatic environment, with only few standards set by the EC since the adoption of broad principles in 1976. Some acceleration of this progress is expected in the next few years.

Solid and Hazardous Waste Disposal and Treatment

The EC has established a Community framework through which all proposals concerning waste collection, disposal, recycling and processing are scrutinized. Toxic and dangerous wastes are dealt with under a separate Directive. The EC has also recently adopted a new Community Waste Management Strategy, the main principle of which is to avoid or reduce the production of waste, the pollution it causes and the wastage of energy and raw materials it involves.

The EC is aware of the inadequacies of its facilities for the safe disposal of toxic and dangerous waste, which are capable of providing capacity for less than 50% of the toxic and dangerous waste created in the Community. In response to this situation, the EC has established a three-pronged policy designed to:

- recycle waste;
- reduce waste which cannot be recycled; and
- dispose of unrecoverable waste safely.

Measures have been adopted to introduce these goals into EC legislation, including a general Directive on waste (currently being amended), a Directive covering the collection and disposal of waste oils and a Directive on toxic and dangerous waste.

As in the air and water quality areas, most of the Directives in the solid and hazardous waste field are only general policy frameworks that appear to leave considerable latitude in their implementation by member states. Efforts on recycling have also been quite limited. New proposals, yet to be adopted, would narrow the scope for regulatory laxity in both general waste and hazardous waste management, particularly in the definition of hazardous waste, stipulating handling and disposal methods, and controlling transborder shipments. A new Community Waste Management Strategy is in the planing stages, and is intended to promote 3R activities, proper disposal and site remediation.

Environmental Impact Assessment

Implemented in July 1988, the EC's policy on Environmental Impact Assessments (EIA) puts forward a procedure by which the environmental effects of economic development are brought into the the planning stages of government and industry decision-making. All public and private sector development projects which are deemed likely to have significant effect on the environment will be EIA candidates.

The Directive introduces a common system of environmental impact assessment into Member States' national planning procedures. For example, the agricultural, industrial or infrastructure sectors have to conduct an environmental impact assessment prior to breaking ground on a new project. When assessing these projects, environmental considerations are to be balanced against economic, social and other benefits of the project in question.

Projects are divided into two streams: those which require mandatory assessment (e.g. nuclear power stations and reactors, asbestos plants, chemical plants; oil refineries, etc.); and those whose assessments are left up to the individual member state to decide.

In practice, the regulations appear to give fairly wide latitude to Member States in terms of the stringency of the environmental assessment process, and the manner in which environmental and economic considerations are to be weighted in the decision-making process. This is likely to mean that local political pressures for environmental controls or economic development will still have a significant influence on the outcome of the assessment process.

European Environmental Agency

It has been proposed that a European Environmental Agency (EEA) be formed, in conjunction with a European Monitoring and Information Network, as the basis of a permanent EC environmental monitoring system. It would function as the central focal point in the collection and coordination of environmental information and initiatives by EC member states and non-EC environmental agencies and organizations. It is also intended that CORINE, the Agency's predecessor program, be integrated into the EEA.

A number of specific objectives have been set out for the EEA, including:[11]

- gather, arrange and analyze data;
- supply objective data required for the presentation and implementation of environmental policies;
- help to ensure that environmental data is comparable at the European level;
- promote the integration of environmental data into international programmes to monitor the environment;
- stimulate the development and implementation of environmental forecasting techniques, to enable adequate preventive measures to be taken in time;
- promote the development of methods to assess the cost of harm to the environment, and the cost of measures to prevent, protect and restore the environment; and
- promote the exchange of information on available technologies to prevent or reduce harm to the environment.

Specific information will be required from the EEA in a number of environmental subjects useful to the implementation of EC environmental policy. These subjects include:

- air and water quality;
- soil condition and use;
- waste management;
- environmentally harmful chemicals; and
- cross-border and coastal pollution.

The European Parliament had originally envisaged a larger role for the EEA than the EC Commission. The former saw the EEA as being empowered with the ability to conduct environmental impact assessments on EC-sponsored projects regardless of whether the project was situated within the Community or not. It was also proposed that the EEA be responsible for awarding "green label" certification to environmentally friendly products and technologies. For its part, the Commission defined the EEA's role in more limited terms, confined to the tasks of information gathering and analysis. It was not intended by the Commission that the EEA serve in an interventionist or policing capacity.

[11] Club de Bruxelles, EC Environmental Policy: A Challenge for the 1990's, Brussels, 1989.

A compromise position was reached whereby the EEA is to restrict its activities to data gathering and assessment, which will leave the EC still in a fairly weak position in terms of enforcing environmental policies on member states. This decision will be reviewed, however, in two years.

The EEA's budget is set to rise from $6.6 million to $12.3 million over the next two years. Non-Community countries may be allowed to contribute to the EEA's budget and participate in the agency's functions if it is found that they share similar environmental objectives. Discussions are still on-going as to the eventual site for the EEA's headquarters although Copenhagen and Madrid remain the most likely candidates.

State Aid Policy

In general, the EC acts to discourage assistance by national governments to their domestic industries that can alter the balance of competitive forces within Europe. The monitoring and control of state aid is expected be become an increasingly important aspect of EC competition policy as Member State governments attempt to assist companies in their adjustment to the completion of the Internal Market.

Nevertheless, while not specifically covered by the Treaty of Rome, state aid to firms for environmental protection purposes is generally permitted provided it meets certain criteria. These criteria allow government assistance to industry as long as the total value of an assistance package (excluding tax incentives) is less than that of a 15% grant towards total project costs, and provided that the recipient firm has been in business for at least two years. Also, it must be provided to a company where the assistance is targeted at facilities which have been in place more than two years prior to the introduction of the environmental regulations in question.

In view of the importance of national aid to environmental protection in some member countries (such as Germany, which also uses tax incentives) this exception for environmental programs will be an important one in stimulating future EP expenditures.

Regional Policy and EC Funding of Environmental Protection

Beyond its tolerance for aid by national governments for environmental projects, the EC is also a direct participant in funding environmental protection activities, both through EC programs and as a participant in programs run by other international agencies.

The level of funding allocated to these programs will be critical to meeting EC objectives for environmental health. The poorer members of the EC, who are in the weakest position in terms of their ability to fund necessary environmental infrastructure investments, also tend to be those with the greatest problems remaining to be addressed.

ENVIREG

The EC has established a programme of regional actions in favour of the environment (ENVIREG) as part of the Community's structural funds. It supports larger-scale projects for environmental protection in the poorer regions of the EC that have been designated as eligible for structural aid. The aid must be complementary, i.e. in addition to government funds spent. Within ENVIREG, regional governments have to work out plans for regional development as companies cannot apply directly to the Commission for government funding.

The specific objectives of ENVIREG are to:

- reduce pollution in coastal areas (with particular emphasis on the Mediterranean Basin and, recently, Ireland);
- promote coastal area planning;
- contribute to the control and management of toxic and hazardous industrial waste; and
- develop expertise and training in these fields.

MEDSPA

The EC has also set up the MEDSPA programme (Community Action for the Protection of the Environment in the Mediterranean Basin) to support demonstration projects, projects that raise public awareness and projects to provide technical assistance in the

field of protection of the Mediterranean environment. The difference between MEDSPA and ENVIREG is that the former is regarded as a venture capital fund while the latter provides larger-scale regional aid. In theory, projects which might have started using MEDSPA funds could, if they are successful, be continued under ENVIREG funding.

In order to be eligible for MEDSPA funding, the proposed project must offer "innovative" solutions to environmental problem. Other communities must also be able to benefit from the project.

The requirement for innovation appears to be treated fairly loosely in practice, depending less on the technology than the particular application involved. For example, MEDSPA supported a project that provided for the treatment and re-use of water in the farm sector. Prior to the initiation of the project, farmers in a particular region tended to simply discharge the water they used into the sea after only one use. In response to this, a treatment plant was built that treated the water so that it could be re-used for irrigation. The process also allowed for phosphates to remain in the treated water so as to be used for the irrigation of agricultural produce needing phosphates for growth. While the technology involved in this project was not particularly innovative, it did assist the region in dealing with its water shortage situation.

The total funding allocated to the program is still quite modest; MEDSPA will receive approximately $11 million, $16 million and $18 million in budgetary resources for 1990, 1991 and 1992 respectively. European companies must apply directly to the Commission for funding. In the case of Ontario firms, the companies would have to secure the support of the regional Government or province where the project is located.

NETT

The Network for Environmental Technology Transfer (NETT) is an EC-sponsored database which serves as a source of information on suppliers of EP technologies. By December of 1989, approximately 200 members were listed on NETT. These were large and small firms representing all sectors in the industry.

The database became fully operational effective April 1990. We understand that non-EC companies can be listed in the network at a higher fee. The long-term success, however, of this effort is difficult to predict at this time.

Environmental Programme for the Mediterranean

The World Bank and EIB (European Investment Bank) will assist the Mediterranean within the context of the "Environmental Programme for the Mediterranean" in the following areas: project design and implementation, institution building, policy advice and formulation, and the mobilization of financial resources. Since 1980, half of the EIB's total environmental lending went into the Mediterranean region. The spending amounted to almost $3.3 billion. In addition, the World Bank spent $2.3 billion on environmental protection in the Mediterranean over the same period.

For the "Environmental Programme for the Mediterranean" the two institutions have identified four priorities:

1. Integrated water resource management;
2. Management of hazardous wastes;
3. Prevention and control of marine pollution from oil and chemicals; and
4. Coastal zone management.

During the coming months, the World Bank and the EIB will support pre-feasibility studies of projects to be financed, policy studies on how to address key policy factors and the coherent development of institutional development. Furthermore, the two banks have identified the need of the Mediterranean countries for financial assistance in financing specific projects. For such projects the banks want to coordinate aid coming from various sources.

PHARE and EBRD

As a result of the Paris Economic Summit of July 1989, the EC Commission has been designated as the coordinator of assistance from 24 nations to Eastern European countries. The series of aid packages developed by the "Group of 24" OECD countries is known as the PHARE program (Poland, Hungary, Assistance to Restructuring the Economies). An "action plan" to extend the PHARE program to the other Eastern European countries of Bulgaria, Czechoslovakia, Yugoslavia and Romania has recently been submitted by the EC Commission to the Council of Foreign Ministers and the Group of 24.

The importance of these funds to the environmental protection industry is best illustrated by the case of Czechoslovakia, which has requested the Commission's view on a plan to direct all of its PHARE funding to environmental matters. Poland has received a 1.8 million ECU grant under this program for flue gas desulphurization of coal fired plants.

In some cases, the ability of Ontario firms to benefit from PHARE funded projects will be limited by requirements for the use of inputs from the funding government. We understand that the U.S. tranche of the PHARE program includes a requirement for the use of American suppliers.

Additional funds are expected to flow to Eastern Europe, in part for environmental protection, under the auspices of the newly-established European Bank for Reconstruction and Development (EBRD). The EC, along with other countries including Canada and the United States, have contributed capital to the EBRD, which is in the process of establishing its operations in London.

Other Environmental Initiatives

"The Environment and the Internal Market" Report

The EC released a Task Force Report in November 1989 on "The Environment and the Internal Market". The main thrust of the the report was that the economic growth generated as a result of the 1992 economic integration should not be achieved at the expense of the natural environment:

> the Community [recognizes] that the economic growth stimulated by the Internal Market must not give rise to adverse environmental impacts which would severely detract from the long-term sustainability of the growth process.[12]

The report highlights a number of instances where increased economic growth may be accompanied by increased emissions of pollutants into the environment. For example, the elimination of physical barriers at national borders is expected to increase significantly the level of transcommunity road haulage, leading inevitably to an increase in the level of CO emissions into the atmosphere.

[12] Task Force on the Environment and the Internal Market

The report emphasizes the utilization of the prevention principle, the subsidiarity principle and the "Polluter Pays" principle as the most effective means of strengthening EC environmental policy. The use of market mechanisms (i.e. charges and taxes) is also recommended as a means of ensuring accountability and efficiency. The report also calls for increased monitoring, judging the implications of all EC legislation on the natural environment.

Thus, the overall tenor of the report is one which stresses the need for additional measures to strengthen environmental protection efforts in the Community. Although the report has not been officially adopted by the EC as policy, it may be indicative of the future direction of the EC on environmental matters.

The Use of Economic Instruments for Environmental Protection

A Working Group, comprising some 80 officials, has been established to examine the use of various economic instruments as a means of ensuring environmental protection. For example, taxes could be put in place to discourage the consumption of environmentally-damaging goods. A draft proposal has been completed on this subject and is being sent out to the members of the Working Group. The draft covers four issues: energy, CFCs, transport and waste.

In its consideration of the use of environmental taxes, the Commission has examined consumers' willingness-to-pay for environmentally-friendly product alternatives, and has identified the need for uniformity in environmental taxes to avoid arbitrage. The argument here is that people would shop in the member State which imposed the lowest tax, and as a result, other member States would have to follow suit in lowering their taxes.

As we have already noted, the EC has faced resistance from member states in efforts to adopt uniform standards for emission from individual sources, beyond merely setting out frameworks for national legislation. Similarly, an EC attempt to impose a common approach to environmental taxation was opposed by the UK, which regards taxation as belonging to the domain of the national government.

The EC has indicated its disappointment over the position that the U.S. appears to be adopting over the use of a CO2 tax to combat the greenhouse effect. The U.S. is seen as overly cautious in its approach to allowable CO2 emissions. The EC and the U.S. will continue to negotiate the issue until the Second World Conference on Climate Change, scheduled for October/November 1990 in Geneva.

Proposals on Civil Liability and Ecological Labelling

Two current measures under consideration by the EC would amount to a "carrot" and a "stick" in influencing corporate behaviour on environmental matters. The "stick" would be created by the adoption of a current Commission proposal on civil liability for damage caused by waste. This proposal would introduce a principle of strict liability on a producer for damage caused by waste. The concept of damage would extend not only to personal injuries and damage to property, but also to environmental degradation.

In terms of providing an incentive or "carrot" for environmental protection activities, the Community is also considering the establishment of a uniform standard for ecological labelling - i.e., the labelling of particular products as "green" or "environmentally-friendly. Such a system would be likely to require ecologically-sound practices from "cradle-to-grave", covering the manufacturing as well as the consumption and post-consumption stages of the product's life cycle. With the strength of the green movement rising across the EC, a Community ecological label would prove to be a valuable marketing tool, giving an added incentive for firms to meet what would likely be very strict conditions for acceptance.

EC Public Procurement Policy

As outlined in Chapter 3, public sector bodies play an important role in terms of their purchasing power in European environmental protection markets. Furthermore, public sector procurement policies within the EC have to date served as barriers to imports from both within and outside the Community.

As we noted in Chapter 3, in contrast to the EC's general policy on procurement, some member states, have refused to grant equal access to EC imports in the water, transport, telecommunications and energy sectors. These four sectors were thereby excluded from the initial opening-up of the public procurement process. Nevertheless, agreement was recently reached on this issue and a common position on the proposal for a Directive on the procurement procedures in the excluded sectors was attained.

The new policy will still place impediments on imports originating from outside the EC. Ontario firms could be required by the procuring government to have at least 50% European content for any project for which they tender. Furthermore, there is an obligation on government authorities in Member States to prefer EC bids over non-EC bids if the price differential between them is less than 3% and they are equivalent in every other respect.

Some diplomatic observers have said that this decision to give preference to EC firms was intended to arm the Community with a bargaining tool in on-going GATT negotiations, which are aimed at improving access to public contracts world-wide. The U.S. Government has complained that the EC has designed conditions which are significantly different and more protectionist than the situation that EC suppliers face in the US. EC officials replied that the U.S. also operates a "Buy American" policy by favouring domestic bidders even if they are up to 25% more expensive. The EC has recently shown its willingness to consider a significant liberalization of multilateral procurement policies in the GATT talks.

A Directive for the opening up of public procurement in the services sector within the EC is expected to be presented by the Commission soon, several months after the first draft was circulated in the industrial sectors concerned with this issue. Companies have been pressing the Commission to make certain amendments to the proposal, especially as regards the application of the thresholds. At present the thresholds for public tendering are contracts for services worth 200,000 ECU or more. Companies would like the threshold to be raised, limiting the access of service suppliers from other EC countries.

Implications of EC Policies

Overall, the EC has to date made greater progress in setting standards for environmental quality than in regulating emissions or waste handling procedures at individual industrial or municipal sites. While the overall momentum is towards greater uniformity in emissions standards, there is still some resistance to such standards in countries that have historically lagged behind other EC members on environmental matters. Furthermore, the degree to which the EC is able to ensure that Member States not only establish the required legislation, but also enforce their measures, is still weakened by the relatively modest EC institutional framework for monitoring compliance.

Nevertheless, the combination of new centralized regulatory pressure and increased EC and other institutional funding for environmental projects is expected to provide a boost to demand for some environmental protection goods and services, particularly where government, World Bank or EC funds are available. The EC is likely to remain the key regulatory force in those countries that have typically waited for such outside pressure before enacting national legislation, including France, the U.K., Belgium, Italy and Spain. In other countries (e.g., Germany, the Netherlands, Denmark), national legislation may run ahead of EC requirements.

Although not an exhaustive list, the following are some of the areas in which EC policies are likely to generate near-term environmental protection expenditures:

- flue gas desulphurization (and later, denitrification), particularly for large combustion processes and new municipal incinerators;
- continuous emission monitoring equipment for CO, dust and HCl for municipal incinerators;
- catalytic converters for automobiles;
- municipal wastewater treatment plants situated near bathing areas or eligible for funding under programs for the Mediterranean basin;
- environmental impact assessment consulting;
- clean technology engineering for new industrial plants;
- substitutes for CFC's;
- monitoring and testing water quality, for such contaminants as mercury, HCB, cadmium, DDT and carbon tetrachloride; and
- municipal and regional solid waste management.

Major expenditures in these and other areas could be triggered if some or all of the proposed directives aimed at tightening EC policies are adopted. In the longer term, as national governments recede in importance relative to the Commission, and pressures to put industry on a level-playing field in terms of environmental protection costs increase, these tougher measures will have a greater likelihood of adoption. At present, however, it appears that the impetus for very tough action on the environment may well rest with the national governments of the EC member states, particularly in some of the major EP markets where national standards already exceed what is likely to be agreed upon by the Community.

EC procurement policies have been a trade barrier in the past, particularly due to the favoured position of local service sector companies. The new EC measures on procurement, and EC tariff policies, neither create a new "Fortress Europe" nor a wide-open market for Ontario companies. However, due to EC content requirements and the national barriers discussed in Chapter 3, Community and state-level policies will continue to favour strategies that link Ontario firms with companies resident in the targeted national markets.

4.3 Developments in EC Member States

Overview

While the EC is providing broad directions and, in some cases, specific regulatory requirements for environmental protection, the market for EP goods and services in member states will be much more directly influenced by their national and regional governments. As in North America, demand for EP products is driven largely by the combination of tightening regulations and enforcement in the face of previous negligence on environmental matters, and economic growth that increases the volume of waste generation.

Chapter 3 provided an overview of the current market for EP products and services across the EC. In this section, we focus on the future trends in these markets that will have an impact on the opportunities available to Ontario firms.

Table 4.2 provides an overview of the factors affecting future demand for environmental protection products and services among the six EC countries that account for the bulk of the total Community EP market: Germany, France, the U.K., Italy, the Netherlands, and Spain.

Future demand for EP products and services is likely to remain strongest in the countries which currently have the largest environmental markets. Thus, the first column, which draws on the data in Chapter 3, provides an estimate of the current EP market size. Countries that have been quick to implement EC environmental policies in the past, as indicated in the second column, may be more likely to comply with some of the recent directives requiring EP spending. Growth in expenditures will also be linked in part to a country's past efforts on environmental protection, as evidenced by the country's existing industrial and municipal infrastructure. This is indicated (very generally) in the third column. The final column deals with the intensity of public opinion about the state of the environment. In other words, the greater the public concern over the existing state of the environment, as indicated by the results of a cross-EC poll, the more likely are national governments to enact and enforce new environmental regulations.

Despite its existing lead in environmental protection, even excluding the impact of German re-unification, Germany is likely to remain by far the largest EP market, due to the political strength of its environmental movement and the sheer size of its industrial economy. Italy and Spain are likely to gain in overall market importance due to the economic growth anticipated in Southern Europe, the degree of the problems remaining to be addressed, and support for environmental protection from public opinion (Italy) and externally-provided funding (Spain). Neither is likely to surpass the U.K. or France in total spending on the environment.

Tables 4.3 and 4.4 provide a forecast prepared by the French consulting firm BIPE (Bureau d'Information et Provisions Economique) on the future growth in environmental markets in EC countries, and on the total growth in the EC by market segment. Along with Helmut Kaiser and some other market observers, BIPE appears to be on the optimistic side of what might be a reasonable forecast range. Other observers are more cautious, citing the considerable risks to the growth in EP markets associated with the potential lack of enforcement by member states and the EC, and the fact that many key EC measures are still at the proposal stage.

The focus of this report, as set out in the terms of reference, was towards identifying the nature of opportunities and challenges to the Ontario EP industry arising from European economic integration ("Europe 1992"). A fully detailed review of legislative and technological trends in each of the member states is thus beyond the scope of this study. However, in order to further identify opportunities for Ontario firms, we briefly survey some of the developments at the national policy level in major EP markets.

Germany

While Germany is the EC's largest single market for environmental protection goods and services, a number of factors have been limiting recent growth in demand. According to a study for the U.S. Foreign Commercial Service[13], spending has been restrained by public sector budgetary considerations and the fact that much of the spending on air and water pollution control required by existing legislation (mostly dating from the mid-1980s) has already been completed. For example, the spending required by the Ordinance on Air (TA-Luft) and the regulations on large incineration plants for air pollution control is now in the past, and future air quality spending will grow very slowly (excluding spending in what was formerly East Germany).

A recent report by the German Ministry of the Environment set out a number of directions for environmental policy in the 1990s[14]. The integration of East Germany into the Federal Republic is cited as one of the major tasks facing the German government, and three working groups are addressing cooperation between the two regions on environmental matters. The first deals with legal and administrative issues, the second with an ecological development and clean-up plan and the third with energy and the environment.

Solid and hazardous waste treatment and disposal remains a major growth area, with new technical guidelines announced this year expected to tighten standards for hazardous wastes. The environment ministry report also cites future legislation on the need for waste disposal methods for sewage sludge and dust collected by filters as a replacement for the current practice of dumping waste at sea. According to an RBC Dominion

[13] Droege & Company, op. cit..

[14] Germany, Ministry of the Environment, Protection of Nature and Nuclear Safety, Environment Report, 1990.

Securities report, Germany has been a major exporter of wastes, sending 700,000 tons per year abroad (mostly to Eastern Europe) and dumping chemical wastes in Northern France. Tougher national laws and EC controls on transborder movements will add to the pressures on Germany to expand its recycling and incineration facilities.

As noted in Chapter 3, much of the required investment may be undertaken directly by polluters, as major industrial concerns build their own incineration facilities or adjust processes to increase recovery and re-use. A study by Helmut Kaiser Consultancy anticipates the need for close to DM 4 billion for hazardous waste incineration facilities in the next decade.

The environment ministry foresees the need for wastewater treatment investments of some DM 15 billion by regional authorities and DM 6 billion by industry, in part as a response to laws enacted in 1987 to require tertiary treatment for denitrification and the elimination of heavy metals and phosphates. Regional authorities also face requirements for the refurbishing of aging potable water treatment plants after years of stagnant or declining spending, which could cost on the order of $40 billion. While it is not clear how quickly these needs will be addressed, a study by the French consulting firm BIPE predicted an annual water quality market of roughly $10 billion. Biological water treatment (as opposed to chemical treatment) is the major technology in use in Germany.

In terms of the aquatic environment, future government measures will be aimed at protecting groundwater (the responsibility of the Länder, or regional governments, in Germany), reduce sea emissions, and at cooperating with Czechoslovakia to clean up the Elbe river. In the near term, investments have been earmarked for water quality measuring stations and laboratories for testing samples from the Elbe, Spree and Havel rivers. A further DM 600 million has been set aside for future environmental projects in East Germany.

The environment ministry has moved to tighten standards for automotive exhausts. Longer term policy plans include energy conservation measures to reduce emissions from power utilities and the funding of research on transboundary air pollution problems.

France

France faces considerable investment requirements to bring itself up to the standards of EC leaders in environmental protection. However, the French demand for EP products and services is dampened by the lack of regulatory pressure from governments. France has tended to enact only the minimum legislation necessary to meet EC standards.

While a dramatic reversal of this policy is not expected, future government plans for the environment remain uncertain, pending the release of a "Green Plan" for the environment expected to be released by the government to Parliament later this year.

Water pollution control and conservation are expected to be priorities, in the wake of recent drought conditions and concerns over nitrates and other contaminants. Spending on water treatment has been growing slowly, at only 2-3% per year according to one estimate. The fourth investment programme of the "Agence Financière de Bassin" put forward increased aid and subsidies for investments in water purification. The chemical industry was a major beneficiary of this programme. (As opposed to Germany, France stresses chemical treatment methods in its wastewater treatment).

At present, there is still a need for investment in the renewal and the rationalization of equipment linked to water treatment and the water purification in industry. The replacement market for water purification plants is expected to grow, since most local water treatment stations were built in the immediate post-war period.

Household waste collection in France is the responsibility of local government authorities, who then contract out much of the work to private sector companies. (Générale des Eaux has a $600 million/year solid waste business, for example.) There are only 100 authorized dumps. There are, however, 5-6000 unauthorized dumps in place and a further 25-30,000 "wild dumps" with inadequate disposal standards. Competition for disposal services has intensified, with U.S. giants BFI and Waste Management challenging the Générale and the Lyonnaise.

Recycling efforts in France have lagged behind other EC countries (only 25% of glass is recycled in France, as opposed to over 50% in both Germany and Denmark), and the

government sees the need to enhance efforts in this direction. Much of the necessary investment in urban waste incinerators in major cities has already been undertaken, with the remaining market focussed on smaller urban centres.

Full scale hazardous waste treatment and recycling facilities are now available only for solvents. Battery recycling will be addressed in order to meet EC requirements. Action on establishing new facilities for industrial wastes is being hampered by economic constraints, and a lack of available disposal sites.

France has few air quality standards. A 1985 measure imposes an environmental tax of FF 130 per ton of SO2 emitted by 400 large firms, with the funds devoted to desulphurization investments.

United Kingdom

As in France, U.K. environmental policies have not been particularly stringent to date, and have not been extensively updated in recent years. These policies are under review, with a comprehensive Government White Paper expected to be presented by the Secretary of State for the Environment to the Conservative Party Conference this autumn.

The U.K. government is giving emphasis to harnessing market forces to prevent pollution, providing information to households, the reduction of waste generation, and the privatization of water and waste management services. Over the next decade the government expects that more than $8 billion will be spent on water quality matters. Proposed legislation deals with licensing waste management, controlling CFC's, regulating dangerous substances handling, disclosure of contaminated sites, and encouraging environmentally friendly packaging.

Aging sewer systems could require the modernization of 1,000 km of existing systems each year for the next decade. In the past, the U.K. has proved very slow in adapting EC water legislation and in improving its water treatment equipment. Stringent financial performance requirements for local water authorities have resulted in a lack of funding for EP spending.

The privatization of these organizations could provide the necessary boost to investment in this area. The U.K. water boards have raised billions in new capital, with one large board (Severn-Trent) alone expected to spend close to $800 million per year over the next decade on capital projects. The water boards are looking around the world for the necessary technology, with one firm making a recent acquisition of a U.S. chlorination firm, for example. Dumez, the second leading French construction group, recently entered into an alliance with U.K. building group Alfred McAlpine, citing the demand growth prospects it sees in the wake of the privatization of water and power systems.

Currently, most waste is dumped rather than incinerated, despite the fact that the U.K. has been among the leaders in developing incineration technologies. Landfilling has a cost advantage ($3 per ton vs. $17 per ton for incineration), in part due to the availability of clay belts as landfill sites. Tightening legislation on hazardous wastes, the elimination of North Sea dumping, and better monitoring of waste disposal practices are likely to promote the demand for additional incineration facilities. The U.K.'s two largest waste disposal companies, ReChem and Cleanaway, are expanding their incinerator capacity. Another area of focus is on investments to control air pollution from electrical utilities, estimated to cost some $10 billion over a five year period.

Italy and Spain

Previous neglect of environmental matters in Southern Europe has left Italy and Spain with significant problems remaining to be addressed, and they are expected to be the fastest growing national EP markets. Italy is already in the process of upgrading its water purification systems, with 100 of its 1,600 plants being less than a decade old. Even so, only 68% of the plants are deemed to be functioning adequately, and spending constraints imposed by the Italian government since 1987 have delayed needed investments. Privatization of water purification services may be used to meet the strong needs for investment funds in this area.

With much of its population unserved by sewage treatment facilities, Spain is considering a multi-billion dollar program to construct some 2,000 municipal wastewater treatment plants. Another program in the works will devote some 100 billion pesetas for air pollution control. World Bank and European Investment Bank funds will be important engines for the growth of environmental protection spending in Spain. Spain appears headed in the direction of the U.K. towards a privatized system for waste management.

4.4 Eastern Europe

In addition to the EP demand growth in East Germany (discussed above), political and economic reforms in Eastern Europe (particularly in Poland, Czechoslovakia and Hungary where the shift to a capitalist system is proceeding most rapidly) are likely to be accompanied by pressures to address severe environmental problems.

While a detailed review of Eastern European prospects is beyond the scope of this study, it is clear that Eastern Europe represents an attractive longer-term market for environmental protection, both due to the extent of the problems to be addressed and the absence of a domestic EP industry.

The overall Eastern European market is thought to be quite small at present. Some observers feel that it will only amount to about 10% of the demand in Western Europe by the year 2000, even if one includes the U.S.S.R. Constraints on the market include the lack of foreign exchange to pay for equipment and services, the pressing need for industrial development, and the lack of clear liability laws to protect firms engaging in work in Eastern Europe.

As a result of the need for external financing, EP suppliers from countries that are active in supplying trade credits and other financial support packages will be in the best position to tap into these markets. Since much of the industrial infrastructure dates from the early post-War period, EP equipment is not likely to be installed as an end-of-pipe addition to existing plants. Rather, the greatest demand will probably be generated as a part of a general replacement and updating of processing equipment, with western joint venture partners bringing their cleaner technologies with them.

5. OPPORTUNITIES, CHALLENGES AND STRATEGIC RESPONSES

5.1 Introduction

Chapters 2-4 of this report have reviewed areas of strength in the Ontario EP industry, existing EP market conditions in Europe, and changes in this market that will be induced by EC and national policies. In this Chapter, we draw upon the results of these previous Chapters to identify areas of opportunity for Ontario firms in the European market, and the most promising strategies for market entry.

We do not wish to repeat all of the detailed findings of previous Chapters, and the reader is advised that the findings of this Chapter are best appreciated after a complete reading of the rest of this report.

Furthermore, as this is a very broad review of market opportunities and strategies, it cannot be a substitute for a more detailed program of market research and strategy development by any individual Ontario firm focussed on a narrower range of EP goods or services. Rather, the report attempts to reach general conclusions about the nature of the market opportunities and the most promising strategies. As a first step towards the required additional work by a firm that believes it might be interested in Europe, we provide sources and directions for a more detailed market analysis.

5.2 Summary of Promising Opportunities for Ontario Firms in Europe

Four criteria can be used to isolate the areas where Ontario firms are likely to be able to play the most significant role in European environmental protection markets:

i) the competitive strength of Ontario firms manufacturing goods or supplying services in the market involved, as reviewed in Chapter 2, relative to existing suppliers in Europe, as reviewed in Chapter 3;

ii) the current size of the European market as reviewed in Chapter 3;

iii) the growth prospects for the market, including the influence of EC and national policies on the environment and the extent of problems remaining to be addressed; and

iv) the extent of entry barriers, both pre-existing and those introduced by procurement policies of the EC.

Based on these criteria, a number of opportunities have been identified as having the most promise for Ontario companies.

- **Ontario strengths** lie mainly in engineering consulting, some niche equipment products (specialized wastewater treatment equipment, monitoring equipment, flue-gas desulphurization, etc., but less so in high volume, lower technology products or instruments), solid waste management services, and in adapting technologies to the needs of resource processing industries[15]. Although engineering consulting is a provincial industry strength, the opportunities for activity in Europe may be limited by the competitiveness of the local industry in Europe, the large civil engineering component of environmental projects which can be readily served by European firms, and the costs of relocating scarce skilled resources to Europe when local Ontario demand is strong. Those firms that can supply equipment or patented processes along with design work will have the greatest promise in Europe.

- **The largest EC markets** will continue to be found in Germany, France and the U.K., although some Southern European countries may be larger in specific areas such as new wastewater treatment plants.

- **The fastest-growing EC markets** will be those of Spain, Portugal, and Italy, but these markets will not surpass in size those of the three larger EC countries cited above, and may therefore not be of as much interest to Ontario firms, particularly those offering advanced monitoring or abatement solutions. Engineering and other service sector firms, however, are likely to be in a better position to compete with the domestic firms in these less-environmentally-advanced

[15] Similar conclusions were reached in a brief review of European opportunities for the Ontario International Corporation, but this report differs on target markets and best sources for alliances in Europe.

countries, and they may be attractive points of entry for firms with good skills but no particular advantages over German or other Northern European suppliers.

- **The Eastern European market** will grow rapidly, but remain small by Western European standards. However, Eastern Europe appears to represent the best opportunity for Ontario resource processing companies interested in marketing both environmental and overall processing technologies through licences or joint ventures.

- **Barriers to entry** will be low in terms of tariffs on most items, but very significant in terms of non-tariff barriers for service sector firms lacking a strong local presence. This will be particularly the case where the domestic players are strong, locally-based firms, such as in Germany.

Details on legislative and expenditure trends are provided in Chapters 3 and 4 and are not repeated here. However, in some cases, such as for wastewater treatment in Spain and air pollution control for utilities in Spain and the U.K., a surge in spending in a particular area may favour a particular market for some firms in given period.

Overall, while the European EP market is likely to see significant growth due to EC and national regulatory changes, we believe that only selected Ontario companies will have the technological advantages relative to existing European market suppliers to find an entry into this very competitive market profitable, particularly during a period in which North American demand will also be growing strongly.

Although a number of firms may sell services directly for individual projects in Europe, a major breakthrough would entail establishing a permanent presence in the EC market. This is a costly exercise, however, sustainable only by the larger Ontario EP service firms. Strong demand will create opportunities in Europe - if only due to the limited number of qualified engineers available to meet a growing environmental demand - but some Ontario EP firms will also find themselves short of skilled staff to meet North American demand.

5.3 EC Market Entry Strategies

Goods Manufacturers

As noted above and reviewed in Chapter 2, most Ontario environmental equipment manufacturers would be unlikely to be able to compete in Europe on a broad front, being either branch plants of foreign-based firms or manufacturers of heavy, basic equipment with few technological or other advantages over European suppliers.

There are a number of firms, however, with unique technologies, marketing skills, and other strengths that make them potential candidates for equipment exports to this growing market. Some of these were identified in our survey of the Ontario industry, and there are undoubtedly others whose products have not been brought to our attention.

While some Ontario firms have already actively sought sales in Europe, others have not yet seriously explored the opportunities due to distance, local preferences, tariffs, and other factors which in the past made the European market appear unattractive, particularly in view of the strong EP demand growth closer to home in North America. The push for greater environmental controls from both the EC and national governments in Europe, and the growth in environmental awareness in Eastern Europe, could provide the necessary inducement for more Ontario EP manufacturers to seek sales in Europe.

Two basic approaches exist for generating sales revenue in Europe: 1) exports from Ontario, either directly to the final consumer, through a local branch office, or through an agency relationship with an existing European firm; 2) manufacturing in Europe, in either a greenfield plant established by an Ontario company or the facilities of an existing firm acquired by the Ontario company; through a joint venture with a European manufacturer; or through a licensing agreement with a European manufacturer.

Based on the existing trade pattern within Europe, **direct export** is likely to be most feasible for high-value, low-volume, light (low transport cost) products such as instruments, monitoring equipment and analyzers, specialized filters, and so on. The EC has already been penetrated to a degree by some Ontario firms (in such fields as monitoring equipment, wastewater treatment equipment), as well as by U.S. instrument and air pollution control equipment manufacturers.

Major equipment items destined for public sector projects could face constraints associated with European content requirements, informal local preferences, as well as transport cost disadvantages. Local competition has tended to be weaker in such countries as Spain, where previous environmental controls were quite weak. As a result, importers have generally reaped the largest market share in Southern European countries, such as Spain, Portugal, and in some of the smaller countries in Northern Europe.

For equipment that is central to an environmental protection process, a local presence is generally necessary for marketing support and to ensure buyers that after-sales support will be provided. In all but the smallest countries, most EC and U.S. companies active in the market have still found it necessary to have an office based in the particular target country. Despite the ongoing process of economic integration, language, cultural and other barriers are likely to persist for some time, restricting the ability of firms to use of a single EC office to serve all national markets within the Community.

Clearly, the cost of operating multiple offices makes such a strategy difficult for most Ontario equipment manufacturers, given their moderate size and niche market orientation. Europe does not have a network of manufacturers representatives as is the case in Canada and the United States. As a result, Canadian exporters of environmental protection equipment have typically set up their own commissioned sales agents, or have allied themselves with local manufacturers or integrated firms.

Either of these approaches can be done at a fairly modest cost. One very successful Ontario firm maintains a small Western European office at an annual cost of only C$30,000 (plus commissions for their agent).

As the issues are quite similar, we discuss the selection criteria for such partnerships below, in our treatment of joint venture and licensing strategies.

In-house manufacturing in Europe through a greenfield investment or acquisition is unlikely to be selected as an entry strategy by most Ontario EP firms looking at selling equipment to Europe. Such an investment is likely to be too risky for most firms given their existing size and the size of the niche markets in Europe that they would be able to serve.

Licensing or joint venture arrangements for European manufacturing are likely to be the favoured alternatives for firms seeking to avoid the transport costs, tariffs and other trade barriers associated with direct export. The Japanese appear to have found technology licensing to be an attractive means of marketing their denitrification technologies, and the Germans have engaged in similar arrangements with local firms in other EC countries.

For either licensing or commission marketing agreements, our view is that German companies are likely to be the most promising point of entry into the EC. The strongest German partners would be able to offer the following advantages:

- the largest home country market in the EC;
- the demand growth associated with German reunification and the significant environmental problems to be faced in East Germany, and a good point of entry into the rest of Eastern Europe;
- existing branch offices, joint ventures and contacts in other EC countries, as the leading source of environmental technologies in Europe;
- a reputation for technological excellence;
- location near the leading environmental trade fairs;
- links with other German industrial concerns and financial institutions; and
- skills in both manufacturing and engineering, and sometimes links to construction firms as well.

Some firms in other countries (particularly the U.K., France, Denmark and the Netherlands) would be able to offer some, but not all, of these attributes. The Netherlands, Denmark and Sweden have good reputations for dealing with environmental problems, but Denmark imports a substantial portion of its own equipment needs and Sweden lies outside the EC (and therefore would not provide tariff free access to the EC). Some French firms (e.g., Degremont) have good international reputations and experience, but the domestic demand growth in France has been fairly slow.

A U.K. partner would offer advantages in terms of a common language, but U.K. firms have been slower to establish positions elsewhere in Europe than those in Germany, and lack the solid links to service sector firms (due to the historic public sector role in

services). The U.K. market, being generally distinct from that on the continent, might be a good starting point for some Ontario firms given the lack of a language barrier and the strong spending prospects in such fields as water treatment.

There are some advantages in linking up with a non-integrated firm. The large integrated engineering and equipment firms will generally only be able to use the Ontario firm's equipment on their own projects. A non-integrated joint venture partner, or an independent agent, will therefore have access to a much broader range of potential projects.

Beyond an initial base (with either a manufacturing facility, joint venture or licence), an Ontario firm may find it necessary to have a similar local presence in each of the major target markets for its products. This could either be accomplished by selecting as a partner a firm with an existing base in each of these countries (as would be case for many of the leading firms in the EP market) or by selecting new partners or agents in each of the other markets. A strong agent with good language capabilities might be able to serve two or three target country markets.

Another possible strategy would be to enter into a consortium or other partnership arrangement with an Ontario firm that has already taken one or more of the above steps to enter the European market. This might be particularly attractive to very small Ontario firms, that could otherwise not finance the costs associated with establishing its reputation, and finding and negotiating with a joint venture partner in Europe. However, in our view this is less likely to be the most promising approach for most Ontario firms with significant sales prospects in Europe.

5.4 Market Entry Strategies: Services

Engineering consulting, waste management, modelling, and other service sector suppliers face a similar range of possible modes of entry into the EC market. There is generally far less scope, however, for direct export of most environmental services.

National accreditation requirements for professionals, local content requirements, language barriers, the need for local contacts to get on tendering lists and provide after-sales support, and the need in the case of on-going services for long-term resident personnel (e.g. waste management) will often preclude any extensive use of Ontario-resident staff for the supply of environmental services, beyond perhaps the occasional single-project contract. Even among firms based in the EC, a direct presence in the target national market appears to be a requisite for any serious effort at market penetration in services.

In the near term, most Ontario firms are likely to be reluctant to move large teams of skilled personnel to Europe in view of the strong domestic demand for environmental engineering. In the longer-term, the strong demand for environmental engineering expected in Europe in the next decade could leave European firms unable to meet all of the demand, and open up opportunities for Ontario firms to work as subcontractors to European engineering firms.

The required local presence can be achieved through a number of alternative means. A firm seeking a long-term, large scale presence in one or more European markets might seek an acquisition of an existing environmental services firm. Ontario firms could then use domestically-based staff to fill in for specific needs in their European operations.

Two recent examples of acquisitions in the EC market for environmental services are Laidlaw's acquisition of Attwoods, a U.K. waste management firm, and SAUR's (a unit of the Bouygues conglomerate in France) recent purchase of a stake in two Spanish firms. Judging by announcements of such acquisitions in European Report, it appears that many firms opt to acquire only a minority stake in the target firm, perhaps in order to preserve the local national character and ownership presence seen as an advantage in public sector contracts.

A lower cost, more limited entry strategy, which is likely to be more commonly used by Ontario firms, would entail entering into a **joint venture** or other agreement to cooperate with a local service sector firm. The U.K., Spain or Italy might be attractive options for Ont[illegible] engineering or waste management firms interested in participating in only one national market, due to demand growth and the absence of very strong local firms. As an overall centre for European activity, Germany might be a favoured choice for a joint venture or other cooperation agreement, for the reasons cited in Section 5.3.

Joint ventures are likely to be of interest only to those Ontario firms with unique skills that give them a competitive advantage in Europe. This might include engineering firms that have patented processes, or labratory services firms with particular technological know-how.

Establishing a **greenfield office** in the EC is an alternative to entry by acquisition. An office in a single country, however, is not likely to be effective for a pan-EC strategy, due to the same trade barriers cited above. Possible sites for a base office would be Brussels (for EC contacts), Germany (for many of the reasons cited above for goods producers) or the city selected for the new European Environment Agency (likely to become a centre for environmental activity in Europe). The costs of such a pan-European strategy, however, make it unlikely that most Ontario firms would want to undertake such investments.

As discussed above, Ontario **resource firms** (steel, other metal smelting and refining, pulp and paper, etc.) could seek to market their overall technological knowledge, including environmental protection systems, to their European counterparts[16]. This would of course require some form of partnership, licensing agreement or other arrangement with a European resource processing firm. Firms in Northern Europe, including Scandinavia and Germany, are likely to be as technologically advanced as Ontario in this regard, and therefore might not be the best candidates for such activities. The leading Southern European firms are also unlikely candidates as they are already well along the road to establishing such relationships.

The best prospects for such agreements may well lie in Eastern Europe. Since doing business in Eastern Europe requires quite a different approach than in the EC, depending on the target country, an analysis of the appropriate entry strategies is beyond the scope of this study. Some firms have suggested that bringing Eastern Europeans to Ontario to work with Ontario engineering firms would be a way in which Ontario firms could participate in projects in Eastern Europe without incurring the costs of relocating key Ontario personnel, while conserving on the foreign exchange costs to Eastern Europe through the use of their own manpower.

[16] This opportunity was particularly stressed for the Ontario International Corporation report on European EP Markets.

5.5 Other Steps to Marketing in Europe

Many of the other necessary steps to establishing a market presence in Europe will be familiar to Ontario firms that have already followed similar steps in achieving a position in the domestic or North American market.

Trade missions, fairs and conferences are important mechanisms for establishing contacts with buyers or potential partners in Europe. Delivering conference papers on pilot projects or other efforts is often a necessary step for achieving recognition; German buyers in particular tend to look for endorsements of results by the academic community. Among the leading fairs and exhibitions are those held annually in Hanover and Paris, and those held every 2-3 years (in rough order of size) in Frankfurt, Munich, Düsseldorf, Freiburg, Essen, Saarbruchen, Milan, and Amsterdam. Smaller fairs are held annually in London and less frequently in Bilbao, Padua, Lyon, Nürenberg, Brussels, Utrecht, and Herning. (See Figure 5.1).

Pilot projects are often necessary to demonstrate the effectiveness of newer technologies in the environmental field. As we noted in Chapter 4, Ontario firms could be eligible for EC funds for such projects if sponsored by a local authority under the MEDSPA program. One Ontario firm has had success by building a pilot project close to a trade fair, and then bringing fair participants to view the project.

Of course, **personal contacts** with EC market participants, including final buyers, project engineering firms, and potential joint venture or licensing agreement partners, are a necessary aspect of marketing EP goods and services. Given the long lead times for major capital spending projects, these efforts often require considerable patience before the rewards are realized through signed contracts. Commissioned sales agents can often do this long-term ground work on behalf of Ontario firms.

5.6 Sources of Further Information

This report has only scratched the surface in terms of providing the detailed market research that would be required by any given Ontario firm exploring a particular country or product/service market. In the process of conducting our research, we have identified a number of sources that could be useful starting points for additional market intelligence:

- reports on the European market, such as those by BIPE (Paris, France), Helmut Kaiser Consultancy (Tubingen, Germany), and others cited in the bibliography to this report;
- a directory of European Expertise in Water and Waste Water Treatment Technology, including lists of firms, activities, cooperation sought, technologies available for licensing, etc., available from Metra Martech, London;
- consulting firms active in the European market;
- local Chambers of Commerce and industry associations in Europe, particularly for identifying lists of potential joint venture partners;
- literature reviewed in a recent Ernst & Young survey of worldwide information sources on the environmental protection market, prepared for the federal Department of Industry, Science and Technology;
- Canadian embassies and Ontario trade offices in Europe, particularly for gathering information on rules for doing business in Europe, making contacts with local firms, identifying trade missions or fairs;
- trade magazines and directories of exhibitors from major trade fairs, useful in identifying local market players in each national market;
- the EC office in Brussels, as well as in Ottawa, for regulatory information pertaining to the EC and the response of member countries to EC directives;
- local and national governments, for information on accreditation and licensing procedures, legislative trends, upcoming projects, and so on.

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TABLE 2.1

ESTIMATED 1987 REVENUES OF THE ONTARIO ENVIRONMENTAL PROTECTION SECTOR[1]

(Millions of Canadian Dollars)

Commodity	Estimated 1987 Revenues
Machinery, Equipment, Instruments, Supplies	$ 250 to $ 400
Recycling Services	$ 500 to $ 1,000
Waste Disposal and Destruction Services	$ 300 to $ 400
Construction Services	$ 350 to $ 500
Consulting Engineering and Analytical Services	$ 100 to $ 200
TOTAL	**$ 1,500 to $ 2,500**

[1] Excludes services provided directly by governments

Source: Ernst & Young (1988)

TABLE 2.2

TRADE IN POLLUTION CONTROL EQUIPMENT
(Millions of Dollars)

Canada	1984	1986	1990*
Imports	$ 441	$ 503	$747
Exports	$ 17	$ 19	$ 24
Trade Deficit	$ 424	$ 484	$723

* Projected

Source: Market Facts of Canada (1987)

Table 3.1

POPULATION SERVED BY WASTE WATER TREATMENT PLANTS
EC & North America - 1970-1987
(Percentage)

		Primary Only					Secondary and/or Tertiary					Primary and Secondary/Tertiary Total Served				
		1970	1975	1980	1985	1987	1970	1975	1980	1985	1987	1970	1975	1980	1985	1987
Belgium	b)	0.0	0.0	0.0	-	-	3.8	5.5	22.9	-	-	3.8	5.5	22.9	-	-
Denmark	e,a)	31.9	29.0	-	20.0	8.0	22.4	41.6	-	70.0	90.0	54.3	70.6	-	90.0	98.0
France	d)	-	-	-	-	-	-	-	-	-	-	19.0	-	43.6	49.7	-
Germany	f)	20.5	18.4	10.2	7.5	-	41.3	56.4	71.6	79.0	-	61.8	74.8	81.8	86.5	-
Greece		-	-	0.0	-	-	-	-	0.5	-	-	-	-	0.5	-	-
Ireland		-	-	0.2	-	-	-	-	11.0	-	-	-	-	11.2	-	-
Italy	g)	8.0	-	-	-	-	6.0	-	-	-	-	14.0	-	30.0	-	-
Luxembourg		23.0	-	16.0	14.0	-	5.0	-	65.0	69.0	-	28.0	-	81.0	83.0	-
Netherlands		8.0	7.0	7.0	7.0	-	37.0	61.0	78.0	83.0	-	45.0	68.0	85.0	90.0	
Portugal	a,k)	1.0	2.0	3.0	3.5		2.1	4.0	7.0	9.0	-	3.1	6.0	10.0	12.5	-
Spain		-	7.0	8.8	13.2		-	7.3	9.1	15.8	-	-	14.3	17.9	29.0	-
UK	h)	-	-	6.0	6.0	6.0	-	-	76.0	77.0	78.0	-	-	82.0	83.0	84.0
EC	k)											**32.0**	**42.0**	**50.0**	**56.0**	**61.0**
Canada	i,c)	-	-	13.0	10.0	14.7	-	-	43.0	47.0	51.5	-	49.0	56.0	57.0	66.2
USA	c,d,g)	-	23.0	17.0	15.0	-	-	44.0	53.0	59.0	-	42.0	67.0	70.0	74.0	-
N. America												**42.0**	**65.0**	**69.0**	**72.0**	**77.0**

Notes:

a) 1985 data refer to 1983.
b) 1980 data refer to 1979.
c) 1975 data refer to 1976.
d) 1985 data refer to 1884.
e) 1975 data refer to 1977.
f) 1970, 1980 and 1985 data refer to 1969, 1979 and 1983.
g) 1970 data refer to 1971.
h) England and Wales only.
i) Secondary: usually includes private treatment and oxidation ponds. Tertiary: refers to secondary treatment with phosphorous precipitation.
j) 1980 and 85 data for the second category include 1% and 2% of non-discharge treatment. 1980 and 1984 data were determined by using different methods than previous data and therefore may not be comparable. Primary: may include some biological treatment. Secondary: preliminary and biological treatments together.
k) Secretariat estimates.

Source: OECD

Table 3.2

TOTAL EMISSIONS OF TRADITIONAL AIR POLLUTANTS
EC & North America - 1980
(1000 Tonnes)

		SOx		Part.		NOx		CO		HC	h)
Belgium		856		267		317		839		339	f)
Denmark		452		47	a)	245		577	d)	197	
France		3,512		483		1,861	i)	6,620		1,972	f)
Germany		3,187		696		2,935		11,708		2,490	
Greece		546	i)	40	a)	217	f)	695	a)	130	f)
Ireland		217		94		71		497		62	
Italy	b)	3,211		386		1,585		5,487		1,566	f)
Luxembourg		24		-		23		-		11	f)
Netherlands		462		162		553		1,450		493	
Portugal		266		119	f)	166		533	f)	159	f)
Spain		2,543	i)	1,521	e)	937	f)	3,780		843	f)
UK		4,836		290	g)	2,264		4,999		2,241	c)
EC	**f,j)**	**20,100**		**4,100**		**11,200**		**37,200**		**10,500**	
Canada		4,650		1,907		1,942		9,928		2,100	
USA		23,900		8,500		20,300		76,100		23,000	
N. America		**28,550**		**10,407**		**22,242**		**86,028**		**25,100**	
World Total	**f,j)**	**110,000**		**59,000**		**69,000**		**193,000**		**57,000**	

Notes:

a) Secretariat estimates refering to 1978; excludes emissions fro industrial processes.
b) Excludes emissions from industrial processes.
c) Total hydrocarbons.
d) Emissions from mobile sources only.
e) 1979.
f) Secretariat estimates.
g) Smoke from coal combustion only.
h) Non-methane hydrocarbons.
i) Excludes some agricultture-related emissions (fertilizers, slurry, etc.), estimated at 700 kt.
j) Rounded figures.

Source: OECD

Table 3.3

UNIT EMISSIONS OF TRADITIONAL AIR POLLUTANTS
Selected Countries - 1980
(Emissions per)

	Capita (kg/capita)					Unit of GDP (kg/1000 US$)					Unit Energy Consumed (kg/TOE)				
	SOx	Part.	NOx	CO	HC	SOx	Part.	NOx	CO	HC	SOx	Part.	NOx	CO	HC
Belgium	87	27	32	85	34	7.3	2.3	2.7	7.1	2.9	24.2	7.5	9.0	23.7	9.6
Denmark	88	9	48	113	38	6.8	0.7	3.7	8.7	3.0	29.3	3.0	15.9	37.3	12.8
France	65	9	35	123	37	5.3	0.7	2.8	10.0	3.0	24.7	3.4	13.1	46.5	13.9
Germany	52	11	48	190	40	3.9	0.9	3.6	14.4	3.1	15.9	3.5	14.6	58.4	12.4
Greece	57	4	23	72	13	13.6	1.0	5.4	17.3	3.2	46.9	3.4	18.6	59.7	11.2
Ireland	64	28	21	146	18	11.3	4.9	3.7	25.9	3.2	32.8	14.2	10.7	75.2	9.4
Italy	58	7	28	99	28	7.0	0.8	3.5	12.0	3.4	30.0	3.6	14.8	51.3	14.7
Luxembourg	66	-	63	-	30	5.3	-	5.1	-	2.4	7.3	-	6.9	-	3.3
Netherlands	33	11	39	102	35	2.7	1.0	3.3	8.6	2.9	8.8	3.1	10.5	27.6	9.4
Portugal	29	13	18	57	17	10.6	4.7	6.6	21.2	6.3	31.4	14.0	19.6	62.9	18.8
Spain	68	41	25	101	23	12.0	7.2	4.4	17.8	4.0	50.3	30.1	18.5	74.8	16.7
UK	86	5	40	89	40	9.0	0.5	4.2	9.3	4.2	35.1	2.1	16.4	36.3	16.3
EC	**63**	**13**	**35**	**117**	**33**	**6.4**	**1.3**	**3.6**	**11.9**	**3.4**	**26.1**	**5.3**	**14.5**	**48.2**	**13.6**
Canada	193	79	81	413	87	17.7	7.2	7.4	37.7	8.0	30.4	12.5	12.7	64.9	13.7
USA	105	37	89	334	101	8.9	3.2	7.6	28.3	8.6	18.1	6.4	15.4	57.6	17.4
N. America	**113**	**41**	**88**	**342**	**100**	**9.7**	**3.5**	**7.5**	**29.1**	**8.5**	**19.4**	**7.1**	**15.1**	**58.4**	**17.0**

Notes: see Table 3.2

Source: OECD

Table 3.4

DISPOSAL OF MUNICIPAL WASTE
Total Collected and Selected Treatment Methods, EC & North America - mid-1980's
(1000 tonnes)

	Year	Total Collected	Mechanical Sorting	Composting	Incineration Total	Incineration % Energy a)	Landfill	Other
Belgium	1980	3,082	-	350	720	29.9	1,530	482
Denmark c)	1985	2,161	-	100	700	-	13,61	-
France	1985	15,000	-	1,200	5,385	63.5	7,080	1,335 g)
Germany	1984	19,386	-	407	5,467	-	13,396	116
Greece	1980	2,500	-	-	-	-	2,500	-
Ireland	1984	1,100	-	-	-	-	1,100	-
Italy j)	1985	15,000	402	834	2,794	21.3	5,286	4,650
Luxenbourg	1985	131	-	-	124	100.0	35	-
Netherlands	1985	6,510	40	300	2,347	71.0	3,595	228
Portugal	1985	1,700 i)	-	280	-	-	399	993
Spain	1986	10,568	-	2,042	542	54.6	7,984	-
UK d)	1984	16,668	-	-	2,233 e)	-	25,510 e)	6.787 e)
Canada	1985	16,000	-	-	960	60.0	14,880	160 f)
USA	1984	178,000 b,h)	-	-	15,000	-	110,000	-

Notes:

a) Percentage incinerated with energy reclamation.
b) Secretariat estimates.
c) Secretariat estimates for amounts by treatment method.
d) England and Wales only.
e) Includes some indsutrial and commercial waste disposed by waste disposal authorities.
f) Includes recycling.
g) Includes mechanical sorting.
h) 1985.
i) Total generation of municipal waste: 2246kt.
j) Treatment methods refer to 1980.

Source: OECD

Table 3.5

ASSESSMENT OF THE TOTAL MARKET SIZE FOR ENVIRONMENTAL PROTECTION AND EQUIPMENT
EC Markets per County and Sector in 1987

	Total US$ bn	Air %	Noise %	Waste %	Water %	% of GDP
Belgium	1.46	n.d.	n.d.	n.d.	n.d.	1.0
Denmark	1.00	18.0	3.0	23.0	56.0	1.0
France	9.62	11.3	4.2	32.0	52.5	1.0
Germany	18.10	29.8	2.7	21.0	46.5	1.5
Greece	0.25	17.0	1.0	32.0	50.0	0.5
Ireland	0.25	4.0	3.0	23.0	70.0	0.9
Italy	5.74	17.0	2.0	35.0	46.0	0.7
Luxembourg	0.12	n.d.	n.d.	n.d.	n.d.	1.0
Netherlands	2.50	20.0	3.4	28.7	47.9	1.1
Portugal	0.12	n.d.	n.d.	n.d.	n.d.	0.5
Spain	1.50	14.0	2.0	30.0	54.0	0.5
UK	8.49	22.0	4.0	28.0	46.0	1.2
EC	**49.70**	**21.4**	**3.3**	**27.0**	**48.3**	-

Source: BIPE

Table 3.6

STRUCTURAL CHARACTERISTICS OF ENVIRONMENTAL INDUSTRIES
COMPARISON OF FIVE EC COUNTRIES

	Germany	UK	Denmark	Italy	France
Number of Firms a)	**4,000** b)	**1,500**	**400**	**2,300**	**n.a.**
· water	450	n.a.	n.a.	1,150	n.a.
· air	300	n.a.	n.a.	250	n.a.
· waste c)	200	n.a.	n.a.	500	n.a.
· other d)	550	n.a.	n.a.	400	n.a.
Structural Characteristics					
· Public/Private Balance e)	Mostly public f)	Privatization underway	100% public	Mostly public	Mostly private
· Engineering	Integrated in industrial groups	Independent or integrated with operations and management	Independent or integrated in industrial groups	Integrated in industrial groups	Integrated in urban service groups
· Diversification g)	High	Low	Average	Low	Average
· Vertical Integration	In progress	In progress	Not operations or management	Low	High
· New Entrants	Electrical Utilities Chemicals Groups Construction Groups	Construction Groups Cleaning Services	Chemicals Groups	Construction Groups State Companies	Construction Groups

Notes:
a) Estimates. Does not include public sector organizations operating water or waste systems.
b) Not including chemical and construction firms.
c) Italian data classified under recyling/reuse firms.
d) UK data classified under instrumentation and services.
e) Collective facilities management.
f) Approximately 50% privatization for municipal waste collection.
g) Diversification level of major pollution control equipment manufacturers.

Source: Task Force on the Environment and the Internal Market

Table 3.7

EXAMPLES OF INTERNATIONAL AGREEMENTS OF EC FIRMS

Firms	Types of Agreement	Environmental FIELD
Intra-European Deals		
· Alsthom (F) - Walther (FRG)	Purchase by French Firm	Air pollution control from stationary sources
· Generale des Eaux (F) - Westech (UK)	Minority control by French firm	Waste management
· Thames water (UK) - Ansaldo (IT)	Joint Venture	Environmental management
· BIFFA (UK) - Antwerp Waster Management (B)	Joint Venture	Municipal waste management
· Kruger (DK) - Holter (FRG)	Joint Venture	Water and air treatment
· Italgas (IT) - Generale des Eaux (F)	Joint Venture	Water distribution
· DOS (DK) - Lyonnaise (F)	R & D Joint Venture	Water treatment
· Paques (NL) - Passavant Imp. (IT)	Licensing of Italian firm	Water treatment
· Paterson Candy (UK) - Cadagua (SP)	Licensing of Spanish firm	Water treatment
· Deutsche Babcock (FRG) - TNEE (F)	Licensing of French firm	Air pollution control, waste incineration
Deals with Non-EC Countries		
· Waste Management (USA) - Cerconsa (SP)	Purchase by U.S. firm	Waste management
· Waste Management (USA) - Ecoservizi (IT)	Purchase by U.S. firm	Waste management
· Atwood (UK) - Industrial Wastes Services (USA)	Purchase by UK firm	Waste management
· Laidlaw (CAN) - Atwood (UK)	Minority control by Canadian firm	Waste management
· LAB (F) - Foster Wheeler Air Pollution Control Division (USA)	Purchase by French firm	Air pollution control from stationary sources
· Kent Process Control (UK) - ASEA (SW)	Purchase by Swiss firm	Instrumentation, control and automation
· Degremont (F) - Dainippon I.C. (JAP)	Joint Venture	Water treatment
· Martin (FRG) - Signal (USA)	Licensing of American firm	Waste incineration
· ESMIL (NL) - Mitsubishi (JAP)	Licensing of Dutch firm	Air pollution control from stationary sources
· Uhge (FRG) - Mitsubishi (JAP)	Licensing of Japanese firm	Incineration

Source: Task Force on the Environment and the Internal Market

Table 4.1

Breakdown of EC Environmental Directives

	Air	Water	Waste a)
Trading Licence			x
Installation Standards		x	x
Product Standards			x
Environmental Impact Assessment	x	x	x
Product Emission Standards	x	x	x
Production Limits	x		
Trading Limits	x		x
Emission Standards for Installations	x	x	x
Standards for Specific Areas	x	x	
Compensation Arrangements	(x) b)		
Voluntary Agreements			x
Product Levies			(x)

Notes:
a) Includes both solid and hazardous waste.
b) (x) indicates option open to Member States.

Source: Task Force on the Environment and the Internal Market

Table 4.2

FUTURE DEMAND FOR EP PRODUCTS & SERVICES
Key Indicators by EC Member State

EC Member State ($US billion)	Current Market Size EC Directives	Rate of Implementation	Past Efforts on EP	Public Opinion
France	9.62	Strong	Average	Weak
Germany	18.10	Very Strong	Very Strong	Very Strong
Italy	5.74	Average	Weak	Very Strong
Netherlands	2.50	Very Strong	Very Strong	Average
Spain	1.50	Weak	Weak	Strong
UK	8.49	Average	Average	Average

Source: BIPE; Task Force on the Environment and the Internal Market

Table 4.3

PROJECTED GROWTH OF EC ENVIRONMENTAL PROTECTION MARKET

(percentage share by sector)

	1987	1993	2000
Total Market	$55 billion	$77 billion	$104 billion
Air	21%	22%	23%
Water	48%	45%	44%
Waste	27%	30%	31%
Other	3%	3%	2%

Source: BIPE

Table 4.4

PROJECTED GROWTH OF EC ENVIRONMENTAL PROTECTION MARKET

(percentage share by country)

	1987	1993	2000
Total Market	$55 billion	$77 billion	$104 billion
France	19%	17%	17%
Germany	36%	39%	37%
Italy	12%	13%	14%
Netherlands	5%	5%	4%
Spain	3%	4%	5%
UK	17%	16%	17%
Other	9%	7%	6%

Source: BIPE

Figure 5.1

European Environmental Trade Fairs

Source: Task Force on the Environment and the Internal Market

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